THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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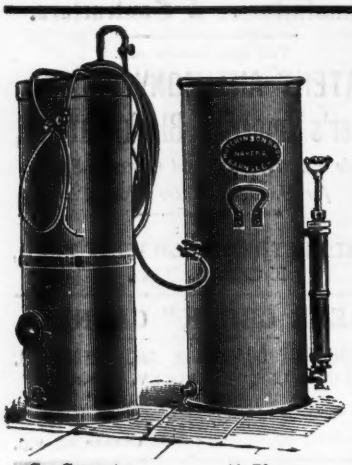

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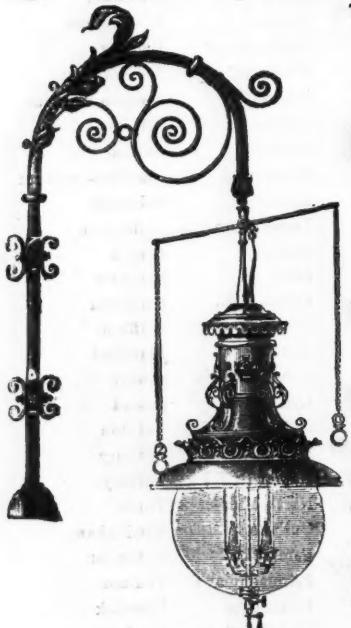

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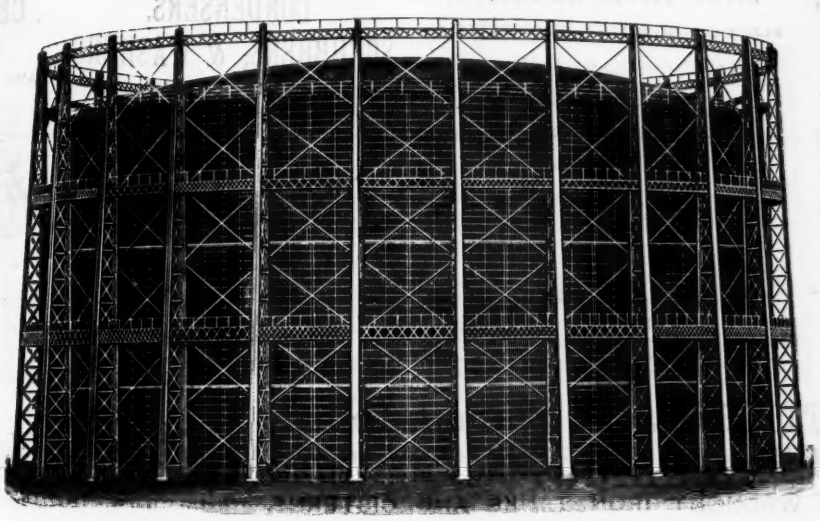

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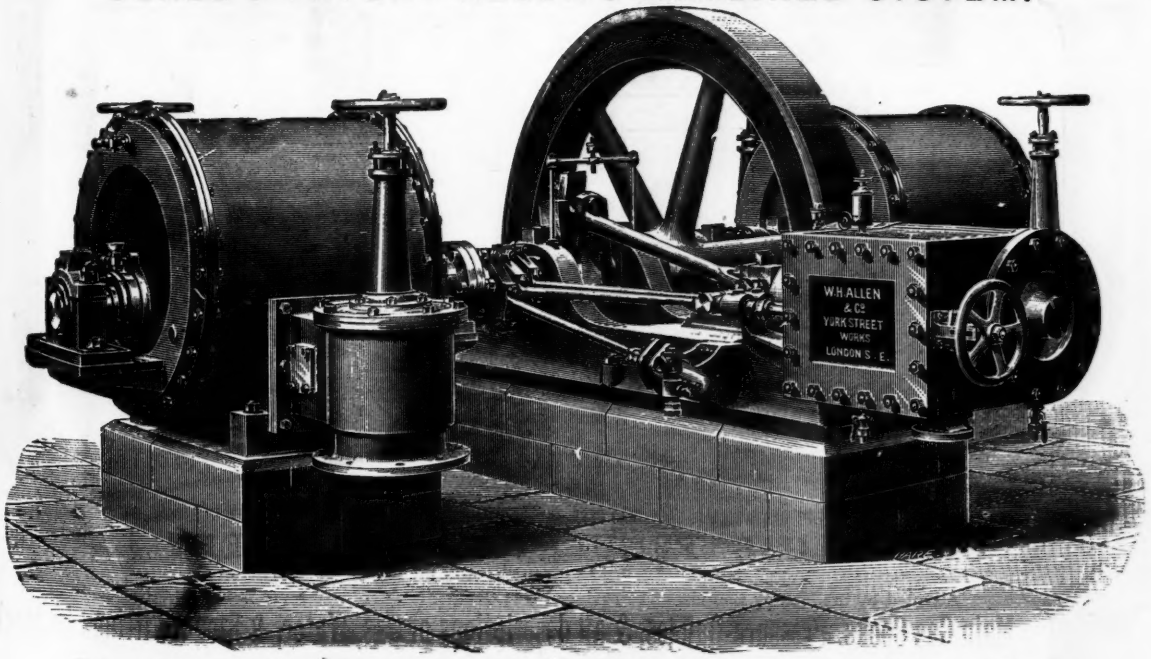

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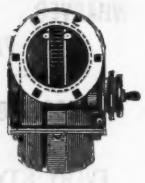

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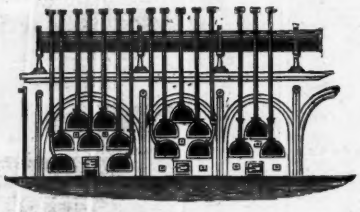

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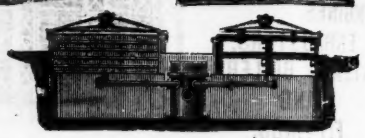

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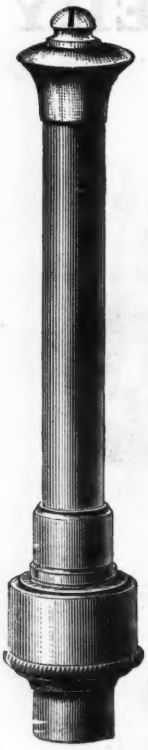

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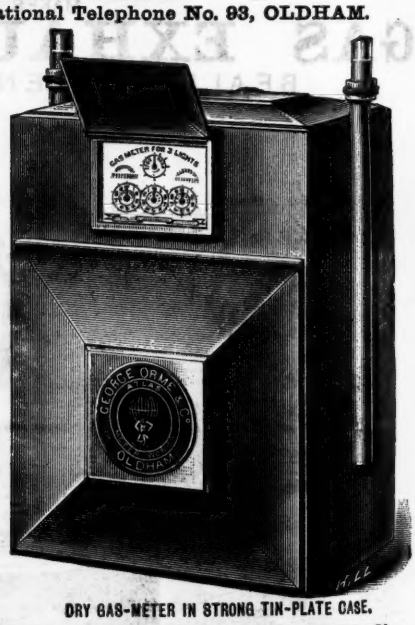

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1895	Athens (Greece)	2	All	64½	42
1890	Tyne Dock Gas-Wks., N.E.Ry.	2	All	71	42
1890	Newburn-on-Tyne	2 & Tank	All	47½	52½
1894	St. Austell Gas Company	2	All	34	34
1894	Birkenhead Corpn.	4	2 Top	160	120
1894	Cape Town (S. Africa)	3	Do.	50	48
1892	Nottingham Corpn.	4	1 Top	100	100
1892	Nottingham Corpn.	4	1 Top	90½	100
1893	Do.	4	Do.	90½	100
1893	Do.	4	Do.	90½	100
1890	Manchester Cor. (Gaythorn Wks.)	3	Do.	130	90
1890	Do. Do.	3	Do.	100	75
1890	Do. Do.	3	Do.	100	75
1889	Do. (Rochdale Road)	3	Do.	100	75
1891	Darlington Corpn.	3	Do.	100	73½
1895	Barrow-in-Furness	2	Do.	100	41
1889	Haslingden Union Gas Company	2	Do.	80	44
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Barcelona (Spain)	2	Do.	98½	52
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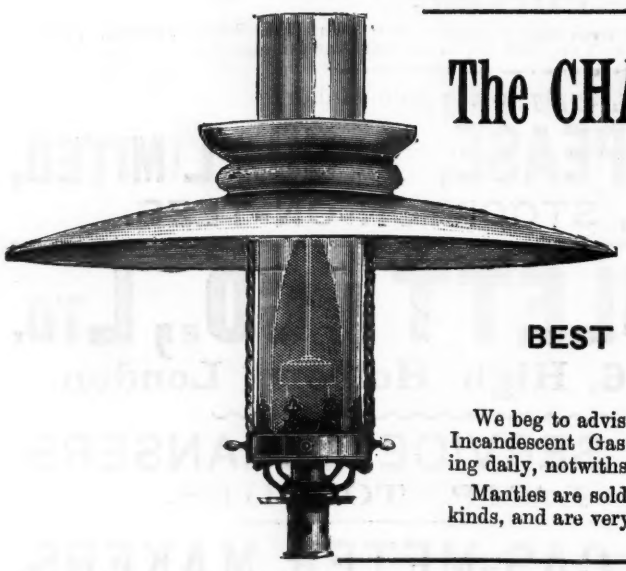

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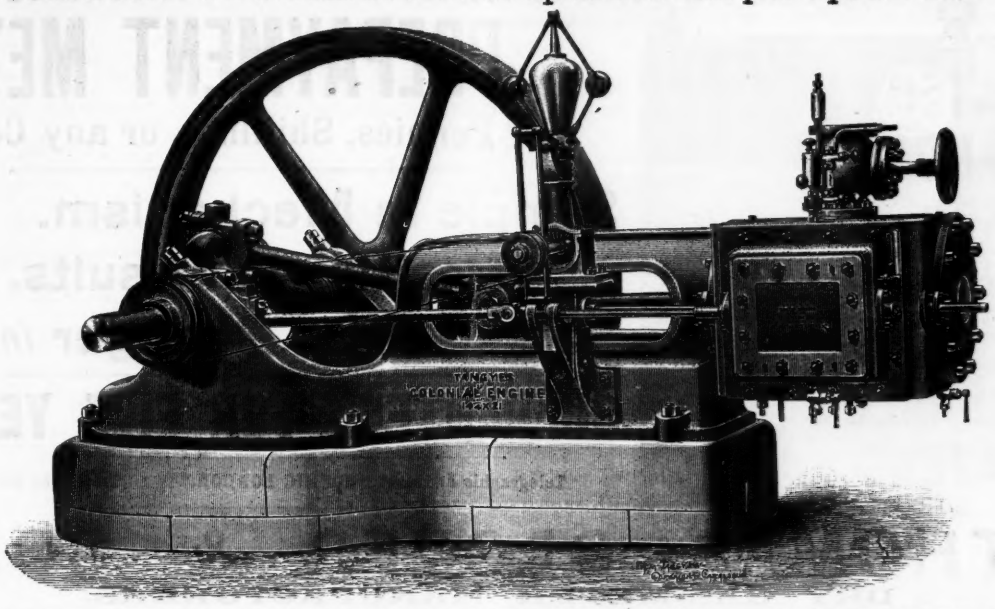

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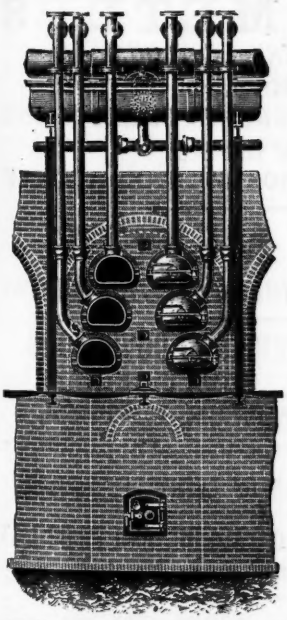

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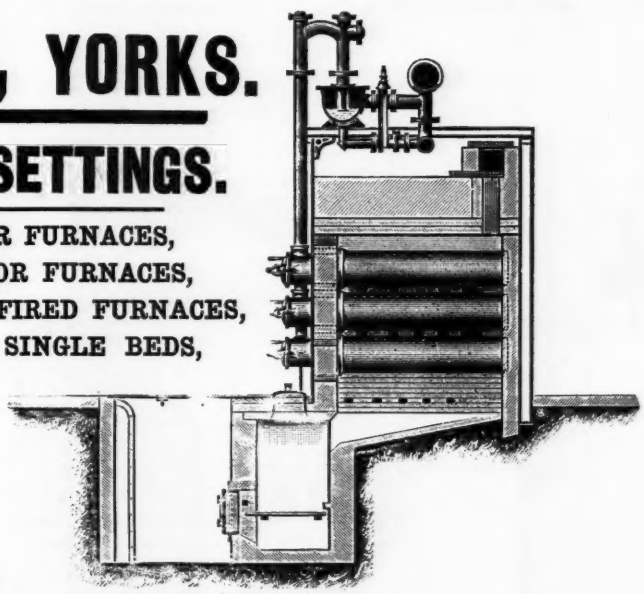

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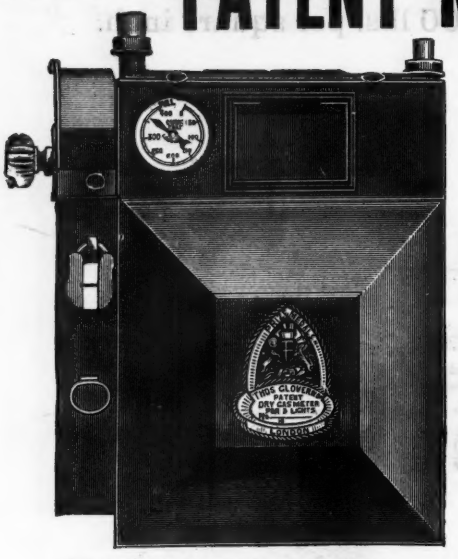

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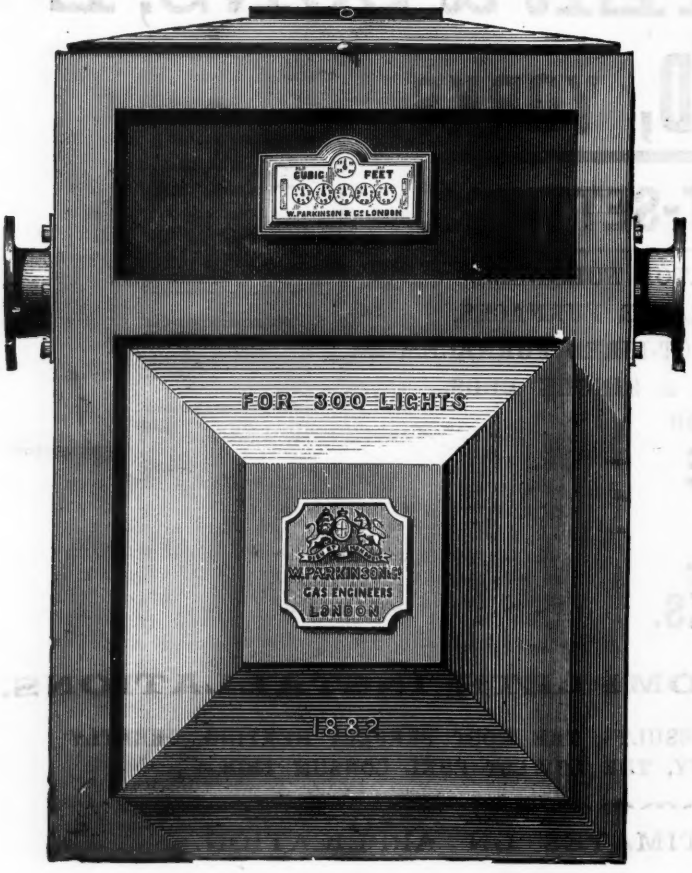

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EDITORIAL NOTES.

Gas Affairs in Leeds.

In another column will be found a report of the last meeting of the Leeds County Council, when certain important gas matters were considered and disposed of. We read this report with mixed feelings, with which those of our readers who take an interest in the gas affairs of Leeds will probably sympathize. In the first place, it is with sincere gratification that we venture to entertain the beginnings of a belief that the worst hour of Leeds gas administration has at length passed. By agreeing without a dissentient voice, either in Committee or on the Council, to substantially increase the salary of their General Superintendent (Mr. R. H. Townsley), the Leeds County Council have taken a decided step out of the condition of degeneracy into which the Gas Department had descended. It is true that the importance of the position of General Superintendent of the Gas Department is yet far from being recognized by the payment of a salary commensurate either with the work or the responsibility attached to it; but the great thing is that a movement, and no mean one, has been at last made in this direction. We desire to comment upon this encouraging incident without dealing specifically with the personal aspect of it. This is far more than a question of improving the position of an individual. Mr. Townsley, of course, deserves his rise; but we can only properly discuss here what is due to the office, not to the man. Hence we prefer to congratulate the Gas Committee and the Council upon having seen at least how miserably inadequate for the recompense of good gas-works management was the scale of salaries ruling in their Gas Department. Naturally, so long as local authorities take the view of gas manufacture that it is a business which any stoker can manage, it is hopeless to ask them to put their gas-works into other hands. Indeed, the chances are even that, if they did pay a good salary to their manager, while not appreciating the quality of good management, they would fail to get value for their money. In the case in point, Mr. Townsley appears to have been able to teach his Committee something in this regard; and this is no small achievement.

The other matter contained in the report refers to the allocation of the profits of the Gas Department. There is an accumulated deficit on the city rate fund of close upon £50,000; and the Finance Committee cannot bring themselves to make a rate, even for the current year, high enough to square the account. In this emergency, it is seen that the Gas Committee had a surplus on their last year's trading; and what more natural than that they should be asked to hand over something from their superfluity to relieve their good friends and companions of the Finance Department? So the request was made; and the Gas Committee proved kind. Hence, on Wednesday the Council were asked to sanction the grant of £18,000 which the Gas Committee proposed to give to the relief of the rate fund. Eventually the motion was duly carried; but not until some home truths respecting the meaning of the proceeding had been uttered by Mr. Henry and other members of the Council. For the subsidy, the old argument as to the gas undertaking being the property of the ratepayers, and so forth, was duly trotted out, and the example of Birmingham cited. It is noticeable how readily these local authorities can follow one another in anything that is bad, while shutting their eyes to what is good. It is quite open to be said to the Leeds authorities that when they know how to administer their gas undertaking, in all respects, as the Birmingham Corporation do theirs, it will be time enough for them to copy Birmingham in the one policy which has lost that city the gas supply of all the outlying districts.

The most pleasing feature of the Leeds debate upon this proposal was the declaration of the Chairman of the Gas Committee that the Council "must not expect to "receive relief annually from the department." It cannot surely be questioned that the right principle in local government finance is to levy rates sufficient in amount to enable the rating authority to pay their way. Mr. John Gordon, of the Leeds County Council, appears to think that, while this may be a right principle in the abstract, it is a great practical *desideratum* that the motion up or down of the rates should be as slight as possible, and an even greater convenience when there is money to be had from a friendly gas department to enable a rising expenditure to be

defrayed without adding to the rates. This is all very well, so far as it goes. Short cuts to solvency, and easy ways of making both ends meet without showing too rigorously where the money comes from, have always been popular, and are not likely to pass out of fashion while human nature remains what it is. But is this style of finance quite worthy of a great English city? It should not be forgotten in Leeds that, after all, it is easy to make gas "profits" when the price of the commodity can be put up to anything that suits the particular turn. There is no credit in securing a favourable balance under such conditions; and the rulers of a manufacturing and mercantile community should be superior to the temptation of patting themselves on the head for cleverness in discovering a profit in the very place where they had arranged for it to be found.

The Imperial Continental Gas Association.

The ordinary general meeting of the Imperial Continental Gas Association was held on Tuesday last, under the presidency of Mr. T. H. Goodwin Newton, the Chairman of the Association. As was very right and fitting, the first subject brought before the proprietors in the Directors' report and the address of the new Chairman was the loss sustained by the Association in the death of Sir Julian Goldsmid. Mr. Newton's reference to this painful topic was marked by deep feeling, and was at the same time characterized by a dignified restraint thoroughly befitting the occasion. For individuals must bear the common lot; whereas institutions, if not everlasting, are at once both superior and inferior to the condition of mortality. As Mr. Newton aptly put it, the actual state of the Association is the most eloquent testimony to the quality of the late Chairman; but, this said, it is the part of those who remain in harness to push forward, and think no more of the past save as a source of guidance for the future. We have every confidence that Mr. Newton will keep the Association in the safe ways along which it has progressed so far. His first official statement is inspired with the spirit of wisdom and liberality. He said in the course of his speech that "he distinctly felt—and was prepared to act on this "policy—that nothing which reduced the cost of gas to "the consumer, other things being equal, could ultimately "do anything but benefit the producer of gas." This declaration rings true; and it is to be hoped that the sound of it will go out in all the cities and towns served by the Association. The facts that the output of the several stations continues to show an increase, and that the number of consumers borne upon the books also grows greater every year, are encouraging evidence that gas lighting more than holds its own upon the Continent, notwithstanding the sharp competition of other systems of artificial illumination. This is a truth the friends of the Association and of the gas industry should never lose sight of, especially as it is something that their competitors and rivals of other lighting industries are particularly careful to ignore. It is for the Directors and Engineers of the Association to cultivate every means for increasing this abiding popularity of gas; and there is little reason to fear that, served as the Association are by officers and agents in London and abroad, any legitimate opening for advancement will be neglected.

The Responsibility for Injuries Due to Leaks from Broken Gas-Mains.

Two County Court cases, which are reported in our "Legal "Intelligence" to-day, deserve mention as instances of damage done by escapes of gas, responsibility for which was carried past the Gas Companies directly implicated, and allowed to rest on third parties. The first trouble occurred at Cambridge, and resulted in an action being brought by a Mrs. Ann Lucas against the Corporation for compensation for personal injuries and damage to furniture caused by an explosion of gas which happened on Dec. 5 last. The plaintiff was not a consumer of gas; but in the course of sewering operations carried on in the street in which the house she then lived in was situated, the sewer trench under the gas service-pipe next door was so imperfectly filled in as to cause the pipe to sink and break away from the main. Gas filtered into the plaintiff's house in consequence; and when she lit her fire, after having been absent all the day in question, an explosion took place which did the damage complained of. Here one may pause to remark upon the repetition in this instance of the frequent peculiarity that gas escaping from a leaky street-main or service-pipe should seek out a non-consumer's house in which to make its irregular presence felt disagreeably. The Corporation did not deny liability; and the case consequently took the course of an inquiry into the facts—resulting in judgment being given for the plaintiff for £43 and costs on the higher scale. The other case was at Godalming; and though it resulted in the exoneration of the Gas Company, who were sued directly, the plaintiff was left to take further proceedings, if so advised, against certain sewerage authorities not mentioned who were left under the burden of blame for what happened. Here again the facts were simple. The plaintiff was housekeeper at the Railway Hotel, near the Old Godalming Station; and she alleged that she had suffered in health, and incurred a doctor's bill, in consequence of an escape of gas in the hotel bar, which did not come from the interior fittings. Complaint was made to the Gas Company, who immediately sent workmen to investigate; and they said the leakage must have come from a lamp outside, belonging to the Railway Company. Ultimately, however, after many days' searching, it was ascertained that the escape was from a small main in the road at a distance of 44 feet from the premises into which the gas undoubtedly found its way—percolating this long distance through the subsoil. The breakage of the pipe was found to be traceable to sewerage operations, for which the Gas Company were clearly not liable; but an attempt was made to fix upon the Company a charge of negligence for not having discovered the source of leakage sooner, after the fact had been communicated to the Manager's knowledge. The Court held, however, that this charge could not be sustained in face of the fact that prompt and continuous efforts were made by the Company to trace the mischief, which was obviously a difficult undertaking in the circumstances. The plaintiff was therefore nonsuited; which was hard upon her, but manifestly only just to the Gas Company. Several morals are to be extracted from these two stories; but we will leave our readers to perform this task. The facts as they stand on the legal record are very instructive.

An Arrangement in the Durham Coal Trade.

According to a report which bears every appearance of authenticity, there has been effected during the past week or so a "consolidation" of interests in the Durham coal-field which may have important results. The story runs that the Earl of Durham has sold all his collieries, fourteen in number, his fleet of "Lambton" collier steamers, numbering twenty, and the locomotives, railway plant, and shipping-staiths at Sunderland, to Sir James Joicey, M.P., of the firm of Messrs. Joicey and Co., Newcastle. The price paid for the property is stated to be upwards of a million sterling; and it is understood the transfer is to take effect as from June 1 next. The output of the existing Joicey pits—thirteen in number, employing 4000 hands—is, of course, considerable; but when the other pits, with their 8000 hands, are added to them, Messrs. Joicey and Co. will control an annual output of 4,500,000 tons of the best coal, with a fleet of fifty collier steamers, loading from the best shipping-spouts in the Tyne Dock, Dunston, and Sunderland. This will constitute the controlling influence in the Durham coal trade, as, besides the enormous bulk of the output, the quality of the coal is the very best that is mined in the county. Naturally, the news of this transaction is reported to have excited the very greatest interest, not to say excitement, in the district; and it speaks well for the reputation of the purchasing firm that the general effect of the move is expected by impartial observers to be beneficial. Certainly, the intelligence is the most important piece of news relating to the gas coal interest of the North that has been recorded by us for a long time. The project, it may be remembered, was referred to by one of our local correspondents last week. It is a very big business, from whatever standpoint it is regarded; and one can but hope that the transaction will redound to the advantage of the Messrs. Joicey and of their customers and employees. Happily, there is nothing preposterous in such an aspiration.

Trade Unionism in Operation.

Work in London appears to be going on very much the same as usual, notwithstanding the statement of the newspapers that upwards of 20,000 labourers in the building trade—a stately number, shortly afterwards reduced to

6000—had gone upon strike to please their egregious Trade Union chiefs. Whether the number of the strikers is 6000 or only 6, will not affect the ultimate issue. There is at the moment of writing the usual report current to the effect that the strike leaders are busily engaged in making the necessary arrangements for distributing strike pay, and are desirous the while of receiving public subscriptions in aid of their straitened resources. This sort of talk is always carefully prepared for the encouragement of the deluded mortals who strike to order; but we shall be very greatly surprised if the funds of the different Labourers' Unions concerned in this particular affair last beyond the fortnight. There will be no public subscription to eke out the Unions' exchequer. Naturally, the strike had not been going on many hours before a "picket," in the fervour of his Trade Unionism, assaulted a free labourer, and got himself hailed before an unsympathetic Magistrate. The officials of the Union were at hand, and prepared to pay the expected fine for their hero. But the Magistrate, with a brief observation that "this sort of thing must be stopped," sent him to prison for a month with hard labour. Trade Unionism cannot flourish if this reactionary attitude on the part of the magistracy becomes general and is persisted in.

Trade Unionism, however, has received even greater discouragement than this magisterial arbitrariness, in the verdict in the case of Trollope's "black list." This case has been mentioned in these columns on previous occasions. It grew out of the conduct of a Trade Union which undertook to punish a number of men who had worked, against its orders, for the important building firm known by the above short title, by posting their names on a large yellow placard edged with black. The object of the publishers of this list was obvious; and they have been duly convicted of having acted in the matter "with "malice," and condemned in £500 damages. The whole story is another illustration of the practical working of Trade Unionism, which is so very different from what would be learnt concerning the system from magazine and "popular" newspaper articles professing to describe it. According to such pictures, the advantages of Trade Unions are so great that no sensible workman can help perceiving them; and, of course, nothing but "moral "suasion" is employed to induce men to belong to these organizations. In point of fact, the independent workman who is disposed to think that the Union is of more benefit to the officials and agitators who live by it than to anybody else, is exposed to every sort of coercion, from the boycott to the brickbat inclusive. If he resists, he is pursued, wherever he seeks work, by the hostility of the Union, which would reduce every working man to the condition of a serf, and make him pay for the chains that bind him under the domination of an irresponsible set of tyrants who can rarely be trusted to take care of the money they extract from their supporters. It is some satisfaction to know that the common law is not powerless to protect the liberty of the subject from the crude forms of Trade Union oppression set in operation against the firm of Trollope and their workmen. But the law needs to be stiffened in certain respects to enable it to deal promptly with those who show by their actions that they are unworthy of that freedom which is supposed to be the most precious birthright of Britons of every degree.

WATER AND SANITARY AFFAIRS.

From the first, as announced by Lord James of Hereford when introducing the Metropolitan Counties Water Board Bill in the House of Lords, it was intended that any authority in the outer area of "Water London" should have the power of seceding from the Board, and having an area to itself for the purpose of the water supply. Yet the provision made for this purpose was to some extent restricted, and required the initiative to be taken by the Water Board. In the debate on the motion for the second reading of the Bill, Lord James promised to afford further facilities, whereby the outer authorities might effect a severance from the central body. In fulfilment of this promise, Lord James has given notice of an amendment to the Bill, enabling the Council of any Metropolitan County to promote a Bill in Parliament for the purpose of providing or controlling (whether by virtue of any agreement with the Water Board or otherwise) a water supply for their county or any part thereof. This would give the outlying authority the power of independent action, so as to bring on the question at its own instance. There is a further provision that, in the event of the Water Board promoting any Bill in Parliament for the purpose of acquiring or controlling the undertaking of any Metropolitan Water Company, or of procuring a fresh supply of water to any part of the Metropolitan Water Area, the Council of any Metropolitan County may apply to Parliament for the insertion in such Bill of provisions enabling that Council to withdraw from the Water Board, and to acquire such portion of the undertaking as may reasonably be considered to be exclusively required for the part of the county which was previously supplied by the undertaking. If such a clause as this could be brought into full operation, it would effectually remove the outer fringe, and would almost seem to threaten the entire existence of the Board. But we need not expect such a *fiasco;* and the amendment is to be looked upon as intended to meet objections plausible at the moment, but destined to disappear under the test of experience. Besides this, it will be extremely difficult to execute such a scheme of division. It is also one thing to introduce Bills, and altogether another thing to carry them. Parliament will have a decisive voice in the matter; and should the Water Board be once formed, it may be expected to maintain its existence, and to comprehend something more than Inner London. The Progressives affect to think that the Bill will be lost. Possibly the Government would not grieve very much over its disappearance. Yet, if the Bill fails to pass in the present session, it must inevitably be revived in the next, unless another change in the Government should sweep it away. Public opinion, if duly enlightened, would probably prefer to let matters remain as they are. But such enlightenment seems a long way off; and if there is to be a new system, the scheme now before Parliament may be considered the best that has yet appeared, or that is even likely to be brought forward.

The Budget of the London County Council, produced at the meeting of that body last Tuesday, showed on the estimate for the coming year an increase of £110,000 in the expenditure, very nearly balanced by an increase since last year in the rateable value of the Metropolis. Although the penny in the pound now produces £6700 more than it did a year ago, the rate remains at 15d. in the pound. Whatever the Council may get they can spend; but a little reduction was effected by the Earl of Onslow in the proposed expenditure on the Water Question. The Parliamentary Committee asked for a vote of £15,000, to defray expenses to be incurred in promoting Bills, and in watching, opposing, or otherwise dealing with sundry Bills affecting the County of London. Among the items, there was one of £9000 in respect of "Bills for transferring the under-"takings of the Metropolitan Water Companies to the "Council, or otherwise relating to the water supply of "London." When this vote came up for consideration, Lord Onslow very properly remarked that the Transfer Bills no longer existed, and the main question had passed into the hands of the Government. Hence the Council had no occasion to burden themselves with any outlay on that account. Taking this view of the subject, his Lordship proposed that the vote should be reduced by £5000. To this proposal the Chairman of the Committee (Mr. M'Kinnon Wood) consented, though he demurred to the way in which the case was put by the noble Earl. The estimate was reduced accordingly; and so much was saved to the ratepayer, for presumably, had the money been voted, it would have been spent, in virtue of the "otherwise." This was vote 74; but there was vote 104, in which the Water Committee asked for £5000 to meet "costs of inquiries into areas of supply, and other expenses "to be incurred with a view to the prosecution of a Bill "in Parliament." But it was specified that, "in the "event of the Council deciding to proceed with a "Bill in Parliament in the session of 1897, to autho-"rize a new water supply from Wales, a further pro-"vision of £6000 may be required." Upwards of £2000 was spent last year by this Committee, besides £14,000 by the Parliamentary Committee, in reference to the water supply. Concerning the vote asked for by the Water Committee, Lord Onslow ventured to hope that, if granted, it would not be taken as an expression of

opinion from the Council in favour of the Welsh scheme or any other. In response, there was an ambiguous answer from Mr. Dickinson, that the Water Committee (of which he is the Chairman) were preparing to report again at length on the Welsh scheme. This further report was promised when the Progressive party beat a retreat in the debate on the Welsh scheme three weeks ago. What good the report will do when it appears, we cannot as yet understand. Are the Committee prepared to show cause why the Council should "proceed with a Bill"? The Water Board Bill is said to have killed the Transfer Bills; but the latter contained the elements of their own destruction. As for the Welsh scheme, it has to encounter not only the Water Board Bill, but also the Bills whereby the Companies propose to enlarge their supply from the valley of the Thames. Why should the ratepayers of London spend millions of money, when the Water Companies are prepared to give a supply on terms much less onerous than those which are likely to be imposed by "a respon-" sible pubile authority"?

The Hybrid Committee on the Water Bills of the London Companies held their first meeting at the commencement of last week, and elected Sir Joseph Pease as their Chairman. It was arranged that the Committee should meet to-day for business, commencing with the Lambeth and Chelsea Bills. It has been pointed out in a "Political Note" in *The Times*, that the judicial character of this tribunal is impaired by the circumstance that two of its members are likewise members of the London County Council—a body which "has taken "up a position adverse to the Water Companies." The circumstance that Mr. Stuart is one of the two members referred to, gives additional force to the argument. Respecting the Water Board Bill, which reaches the Committee stage next Monday, the Joint Parliamentary and Water Committee of the London County Council have prepared a report which will come before that body to-day, giving an official version of the recent conference of the outside authorities. These authorities seem to have lost sight of the fact that the Government Bill pays far more respect to their autonomous claims than the County Council were originally prepared to render.

The position of the modern Police Magistrate is, "taking "one consideration with another," not a "happy one." In addition to administering the criminal law, largely for the benefit of, and in an atmosphere created by, the great unwashed, a Metropolitan Stipendiary is expected to act as the guide, philosopher, and friend of anybody and everybody who wants gratuitous counsel and advice. No wonder that, now and again, a Police Magistrate is found to rebel against this unwritten condition of magisterial existence. It was so with Mr. Paul Taylor at the North London Police Court, when, as reported last week, a medical gentleman came forward and asked the learned Magistrate to set the law in motion against the New River Company. The doctor had a grievance; but he had not taken the trouble to ascertain whether he had a legal remedy. This was a matter of detail which he seemed to think the Court ought to settle for him. But Mr. Paul Taylor took a different view. Asked from the Bench under what section of the Company's Act he wished to proceed, the applicant frankly replied that he really did not know. Told that he might possibly find out with the assistance of a solicitor, the medical gentleman demurred at the idea of being required to incur any expense in the shape of costs. The applicant appeared to think it quite sufficient that he should ask for a summons against the Company for "doing an illegal "act" in cutting off the water supply to an unoccupied house. But the Magistrate, on his part, was not to be moved from his position of masterly inactivity, in the absence of an application of a more definite character. The doctor was "sent empty away" so far as the law is concerned; but, of course, it is open to him to renew his application if he can show proper grounds for doing so. Meanwhile, it is to be observed that these *ex parte* appeals to the law, when reported in the public press, are only too well calculated to prejudice a water company in the eyes of many persons whose prejudice is sufficiently pronounced already.

Projected Supplemental Water Supply for Rye.—Mr. W. Whitaker, F.R.G.S., has been retained to report upon the springs at Cadborough, with a view to their being utilized as a supplemental water supply for the borough of Rye.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1055.)

BUSINESS last week on the Stock Exchange was only on a limited scale; almost everything being decidedly quiet, not to say dull at times. No particular feature was discernible, except a prevailing bump of caution. The public continue to hang aloof, awaiting a clearer view as to the turn some of our foreign problems are going to take; and the elucidation of the Transvaal difficulty, so far as it has yet proceeded, does not encourage them to step in. Consols and other choice things, which had been suffering from the same complaint, yielded to the irresistible force of accumulated money, and had a recovery—Consols touching 112 in the week. As for the miscellaneous crowd, while the Kaffir circus has been drowsy, great animation is manifest in cycles and beer. The Money Market is easier than ever, and apparently without a ray of hope for any change. Business in the Gas Market was more brisk than it has been for some time; and almost every sort of undertaking was strong and buoyant. Gaslight "A" was decidedly active and firm at a trifling rise. Prices varied but slightly throughout the week; but the closing mark on Saturday of 306½ was the best scored. The secured issues were well affected by the demand for investment stocks, and were in good request; and some of the debenture stocks and the "H" 7 per cent. had a rise in value. South Metropolitans were pretty active also, and commanded very choice figures; the "A" being quoted 5 better. A little was done in Commercial old at an advanced price. The Suburban and Provincial group were quite dormant; only one or two transactions being effected in the whole of the week. The Continental Companies were more than usually inactive—transactions being on a very limited scale; but they were firm and steady at their recently advanced prices. Among the remoter undertakings, several have improved upon their previous quotations; some, indeed, attaining to figures which are, to say the least, surprising, though there may perhaps be something to justify them. Australian bonds are doing well. Business in the Water Companies opened with good promise of activity, but soon fell away to a calm. The general tendency was decidedly strong; and the widespread demand for choice investments was apparent in the figures which were commanded by the debenture stock issues. Of the open stocks, Kent and New River advanced; but Southwark fell back a point.

The daily operations were: Business in Gas was only moderate on the opening day; but good prices ruled everywhere. In Australian bonds, Sydney and both Melbourne issues gained 1. Chicago, second mortgage, rose 5. New River Water was 2 higher. Transactions on Tuesday were not more extensive than the preceding day. But South Metropolitans were well to the front; and the "A" rose 5. Gaslight "H" advanced 2, and Cape Town, ½. But Monte Video was ½ lower. Business was much more active on Wednesday; and some high prices were obtained. Commercial old improved 2; Gaslight 4½ per cent. debenture, 2; ditto 4 per cent. debenture, 1½; and Ottoman, ¼. Thursday's transactions in Gas were well up to the mark; but nothing advanced. Southwark Water fell 1. Friday's business was nearly all in Gaslight issues, which realized nice figures; and the "A" advanced 1. In Water, Kent rose 3. Saturday was noticeable for good prices generally. Bombay issues advanced ¼ each.

ELECTRIC LIGHTING MEMORANDA.

A Big Electric Tramway Scheme—Underground Electric Traction—The Trolley-Wire in the Background—Gas-Engine Electricity-Generating Stations.

EVERY now and again the subject of electric traction for tramways is brought under the notice of the general public; but never before has so grandiose a scheme of this nature been propounded as that recently submitted to the London County Council by the County of London Tramways Syndicate. The suggestion was that the Syndicate should act as an intermediary for the acquisition of all the Metropolitan tramway undertakings, which would be transferred to the Council, who should grant a lease of them to a company to be formed by the Syndicate. The rent to be paid by this company would be based, in the case of the paying lines, upon the entire net earnings for the year preceding the granting of the proposed lease; and in the case of the non-paying lines, the rent would be equivalent to the interest and sinking fund on the cost. The point that brings this proposal within our purview is the suggestion that "an underground system of electric traction shall be adopted on all the lines, the cost of the necessary works of reconstruction being borne by the company, and all such works immediately upon completion becoming the property of the Council." The entire cost of equipment and plant for electrical power, it is suggested, shall be borne by the company, but shall, on the expiry of the lease, be purchased by the Council at a valuation to be determined by arbitration. It is stated that the expenditure of the company is estimated at about 3½ millions sterling, and for interest on the whole, and sinking fund as to a large part of this

expenditure, the company would have to depend entirely upon increase of traffic and superior economy of working.

This audacious proposal has not commended itself to the favour of the Highways Committee of the County Council, for several reasons. In the first place, the Committee fail to see why the Syndicate should interpose, as suggested, between the Council and the Tramway Companies, inasmuch as the Council are in a position to themselves negotiate directly with these Companies, if they should so desire. With regard, moreover, to the electric traction proposal, it is observed that the reconstruction of the lines to adapt them for electric traction would of necessity take some considerable time, and would interfere with the use of the lines for the same period. The gravest objection, however, is also the most obvious one, that "it has not yet been demonstrated that the principle proposed to be adopted—namely, electric traction on the underground conduit system—is capable of being worked successfully; and it would be a very serious matter to the Council, as owner of the tramways, if, after the alteration of the lines had been carried out, the system were found to be a failure. . . . It appears so doubtful whether the system will prove successful, that we venture to think the anticipation that by its adoption the leasing company would be in a position to pay a rent equal to the present net earning of the lines is somewhat sanguine."

Of course it is sanguine—what electrical proposal was ever otherwise? The suggestion of the Syndicate was discussed in a leading article in "The Times," which declares the scheme to be well deserving of consideration. "It promises to the public a better, a more rapid, and a more frequent service of cars, and the saving to the local rates which will, it is contended, result from the adoption of electric traction, by which the wear and tear of the pavement will be reduced, and the sanitary condition of the streets improved." It is admitted, however, that there is a question "whether the belief of the Syndicate that electrical traction by the underground conduit system can be employed under the conditions prevailing in the London streets is well founded;" and it is also remarked that expert opinion is not unanimous upon the point. This is hardly the correct way to put it; for, as a matter of fact, the opinion of respectable electricians is that electric traction for tramways is only commercially practicable upon the trolley-wire principle. If underground conduits for electrical tramway working were tried in London, a new trouble and terror would be introduced into the streets, and every gas and water main would be placed in jeopardy. If such a Syndicate as that under notice ever did succeed in getting hold of the London street tramways, however, it would not be long before trolley-wires would appear in the principal tramway thoroughfares.

We observe that the "Electrician" reports despondingly of the prospects of gas-engine electric supply stations in the United Kingdom. At the last meeting of the Belfast City Council, Mr. Andrews said that the Electric Light Committee contemplated the erection of a steam-generating station, so that they might be in a position to supply electricity to the whole of the city. Upon this our contemporary concludes that gas power electric supply stations are a failure in Belfast. We should like to have further information upon this subject before accepting any such judgment as final. The "Electrician" refers to experience with such stations at Coatbridge and Morecambe, as well as in Belfast; and while admitting that "it would be rash to infer from these three deviations from success that gas-power electric supply stations must necessarily fail," regards it as "highly probable that for some time to come both capitalists and engineers will draw the practical conclusion that this class of installation should be left severely alone." This is surely altogether too sweeping a conclusion, formed, too, in ignorance of the circumstances. The advocacy of the gas-engine sub-station system of electric supply by the late Mr. Denny Lane is mentioned sympathetically by our contemporary. We believe that it was Mr. Lane's idea only to employ gas-engines to generate electricity at small stations. It may well be that Belfast wants more electricity, and in a more compact area than can be economically served by a gas-engine station using town gas, and that this is the cause of Mr. Andrews's proposal. There is a limit, of course, to the size of coal gas prime motors which can compare economically in working with steam-engines; and this limit may be surpassed in the case of the Belfast central station. It must nevertheless remain true, as first pointed out by Mr. Lane, that, under certain conditions, a gas-main is the most economical transporter of energy for conversion into electric light.

Royal Institution.—Special interest attaches to the list of members of the Institution elected on Monday last week, as it contains several names which have lately come somewhat prominently before our readers in connection with the incandescent gas-light litigation. Mr. J. Moeller and Mr. J. W. Mackean are the General Manager and the Chemist of the Incandescent Gas-Light Company; and Mr. Dugald Clerk and Mr. J. Swinburne were two of the principal witnesses for the Company. The President for the year is the Duke of Northumberland, K.G.; and among the Managers are Lord Kelvin, Sir Frederick Abel, Sir B. Baker, Mr. J. Hopkinson, F.R.S., Mr. Charles Hawksley, M.Inst.C.E., Mr. James Mansergh, M.Inst.C.E., Mr. T. Tyrer, F.I.C., F.C.S., and Mr. Ludwig Mond, F.R.S. Sir F. Bramwell is the Hon. Secretary.

DR. KENNEDY ON PHYSICAL AND ENGINEERING EXPERIMENTS.

It is not often, in general experience, that a man attains to the object of his desire, or, having it, is satisfied therewith. George Sand has written that the most frightful of all the chapters of a man's individual history is that which bears the heading, "Accomplished Wishes;" and all the minor poets have assured their readers that the pleasures of the chase lie in the pursuit, not in the attainment. In face of all this, we make bold to say that Mr. James Forrest, the honoured Secretary of the Institution of Civil Engineers, must be an exceptionally happy man, inasmuch as the idea of the memorial lecture which has been instituted with the intent of keeping his memory green in the profession of civil engineering, has borne fruit even better than its promise. It was Mr. Forrest's desire that the annual lecture with which his name is associated should deal with the relation of various sciences to the profession of civil engineering. The idea was a good one; but its originator can hardly have foreseen for it so brilliant a realization as it has actually received at the hands of the various lecturers to whom this responsibility has been entrusted. It is no disparagement of the earlier lectures of this series to declare that Dr. A. B. W. Kennedy's address of Thursday last, upon "Physical Experiment in Relation to Engineering," would alone have sufficed to justify the foundation which was instrumental in evoking it; for it was one of those luminous and illuminating discourses which it is a liberal education for those to whom it appeals to study and appreciate.

Dr. Kennedy is a master of many things—literary style included; and to this is attributable the circumstance of his apologizing for the choice of the subject of his lecture at the very end instead of at the beginning of his composition. Like the able man he is, he plunges at once into the middle of his subject, carrying his audience with him; and it is only after he has interested and instructed them to the point of wishing he would go on *ad libitum*, that he suddenly pulls up with an expression of the hope that he has justified his choice! Justified he certainly is; and his justification embraces that of the "James Forrest" Lectures, the Institution of Civil Engineers itself, and the Royal Society which had the perspicacity to choose him for one of its Fellows. He is one of the few living engineers—or, for that matter, men of any profession—who can speak as well as work, of whom it can be truly said that their words lighten up the dark recesses of those arts which pedants only succeed in making more obscure. There is no member of the profession capable of telling more clearly than can Dr. Kennedy either what engineering is or what it is not.

Engineering is, from one point of view, the art of doing things which none but engineers can do. As Dr. Kennedy observes: "There is perhaps no science, except those in the biological group, of which it might not be argued, with some degree of plausibility and reasonability, that the profession to which we all belong has a direct application." This is the point—the engineer is the man who applies the results of other people's science. When one asks what are the results that can be so applied, one is confronted with the consideration which Dr. Kennedy confesses to have great attraction for himself—the theory of evolution in relation to engineering progress. That there is such an evolutionary process in engineering hardly needs proving by reference to example; for everyone can see that engineering is a progressive art, developing along lines and by methods which conform to the universal rule of adaptation to the environment. The subject of evolution in engineering, however, is left for the time being by Dr. Kennedy to some less preoccupied person to deal with, while he confines himself to the more limited subject expressed in the title of his lecture.

First, with regard to physical experiment, which is considered by Dr. Kennedy under three heads. It is, as he shows, most important and helpful in the training of engineering students; next, it is needed for the determination of our most important constants; and, lastly, technical experiments, which are specialized physical experiments, are required to ascertain many matters of direct practical importance. Considering first the purely educative or academical experiment, Dr. Kennedy remarks that its object is the very simple one "that the student should learn first to see and to measure, and then to write down what he has seen and measured." How indispensable this training is, is proved by the experience, common to all engineers occupying responsible positions, of the difficulty of finding assistants "who can be trusted at first even to take quarter-hourly readings of a steam-gauge or a counter, or any such duty, ridiculously simple and easy as it appears." The difficulty of performing such work reliably has its roots deep in human nature itself. "The ordinary mind does not naturally and at once see, and see accurately, the simplest thing that is before the eyes. One has to look, to exercise conscious mental effort, as well as merely to see; and we all of us require to be taught how to look, even in these most simple matters. And when the enforced looking has to be done exactly at a particular time and no other, the average mind is apt to find the whole process an intolerable burden, all the more because it is inclined to despise the work as being too childishly easy for consideration at the very time when it is failing to carry it out."

Then comes the trouble, which vexes the beginner, of doing things to order, the use of which is not apparent, or that have no use at all in themselves. Engage a hundred average men to pick up a stone a day and deposit it carefully upon a particular pile by a certain hour—how many would be found carrying out their instructions after a week or so of such an aimless undertaking? So it is with the engineering student, whose teacher, if he is conscientious, has to "enter into all kinds of subterfuges to get him to take an interest in, or do any careful work at, matters which the omniscience of youth has once pronounced to be 'useless.' Later on, of course, he is wiser, and a trifle less narrow-minded;" but Dr. Kennedy supposes the stage of "first-yearness" to be "one through which all of us have to pass, in one fashion or another, to the grief of our pastors and masters, and to our own later regret."

With regard to the order of physical experiment, the object of which is to find out something not previously known, Dr. Kennedy points out that the physicist has a far wider range of matter to interest himself in than can be legitimately studied by the engineer. "Our interest is practically concentrated on what constitutes only a small part of the boundless region open to the physicist. He can spread his affections over glass and sealing-wax, and let them roam from ice to iron. We have only one love, or at any rate never stray very far from a limited number of matters which concern what I have heard contemptuously called 'technical materials.' He interests himself legitimately and equally in argon and carbon, in steam and in ethyl-alcohol; he loves to extend his thermal conditions so as to get liquid air or gaseous carbon. We, on the other hand, are compelled to deal with a very small number of materials, and with these materials only in states in which we can readily obtain them. In fact, as everyone knows, nineteen-twentieths of our liquid and gas problems affect only liquid and gaseous (or vaporous) water, and only the remaining small percentage is left to be distributed between coal gas and producer gas, liquid carbonic acid and anhydrous ammonia, and so forth." On the other hand, engineers may claim to have the first interest in certain physical results, because they have actually to make use of them in their daily affairs.

Dr. Kennedy points out that a physical experiment aimed at the determination of a physical constant differs very essentially from such physical experiments as engineers have to carry out in the course of their own work. The former is at once simpler and more difficult. It is simpler, because its object is the solution of a particular single problem, which can be more or less isolated from its surroundings. It is more difficult, because the determination has to be carried to the highest degree of exactitude attainable. "Take as examples such matters as the determination of the density of steam, of the variation of the specific heat of water with change of temperature, of the calorific value of pure carbon, or of the mechanical equivalent of heat. Such problems, properly stated, admit each of one exact solution, one answer which is absolutely right, even in the mathematical sense of that phrase. It is the highest object of the physicist, in dealing with such a problem, to obtain the right solution. He spares no pains to obtain it; he determines each minute correction with the patience and care of a man who knows that the value of his whole work may be vitiated by a single overlooked source of error, even of the smallest magnitude." It is only after the physicist has done his work, and determined his constant to the particular place of decimals permitted by the conditions, that the engineer takes his turn at it, and uses the result precisely as it suits his own purpose.

The technical experiments with which the engineer is concerned do not fall under a single one of the conditions cited as characteristic of experiments in pure physics. "We cannot, even under the most favourable circumstances, put before ourselves exact and isolated problems; we have much more often to deal with special than with general cases. We cannot choose problems which are capable of finally exact solution; and therefore, lastly, we should treat the matter entirely wrongly if we attempted to obtain more than a certain limited degree of accuracy in our solution." "Indeed," says Dr. Kennedy, with a fine candour, "I must go further, and say that the truly scientific way of treating an experiment in engineering physics is to recognize from the outset its limitations as to accuracy, and to be careful not to state a final result in a form which should lead to the supposition of any greater degree of accuracy than that which the conditions of the work can actually allow." This is as much as to say that the use of the wheelbarrow and the weigh-bridge in the conduct of an engineering experiment upon a working scale is as truly scientific in its way as the employment for a different purpose of test-tube and chemical balance, if only the terms applicable to the former are not paraded with the pretence of fractional accuracy proper to the latter.

Not merely students, but also "practical" men, need constant reminding that, as Dr. Kennedy puts it, "results cannot be more accurate than data." His predecessor in these lectures—Dr. Hopkinson—said the same thing concerning mathematics. The point is that "the statement of a result in round figures is often much more accurate than its statement down to the last decimal place which appears in the arithmetic." It is not only in respect of marine-engine trials, mentioned as a dreadful example by Dr. Kennedy, that "the statement of the results of observations in five or six figures (of decimals) merely causes the enemy to scoff." Still, it is possible to claim for technical experiment "that it is truly scientific work, if only it be conducted with full recognition of its conditions and limitations, and not as if it were a laboratory experiment badly done."

Dr. Kennedy must have awakened a responsive note in the breasts of his auditory when he alluded to the disappointing character of the data of the usual engineering pocket-book, when consulted by the student eager for guidance as to the manner of solving a pressing problem. "I am sure there must be many of us," he said, "who can still recollect how painfully we endeavoured to make the statements of Molesworth furnish us with an answer to our own problems, and how entirely we failed to get things to fit in. I do not suggest that the fault lay with the pocket-book. The fault lay in the endeavour to correlate figures and results which in no way belonged to each other, which represented the results of experiments made under conditions quite unknown to us, but certainly varying from each other, and no less from the conditions (possibly also unknown to us) of the problem we actually were trying to work out." All young engineers are hungering and thirsting after facts and figures, which when found, according to Captain Cuttle's advice, are diligently "made note of." Unfortunately, pain and disappointment come later, when it is found how extremely difficult it is to make any use of the much-valued figures thus carefully collected. "They would never, somehow or other, seem to tell us just what we wanted. There was always something about them which eluded us, one particular matter of vital importance in the data, or in the result, of which we had no memorandum." The fact is, as Dr. Kennedy plainly puts it, that "no one can usefully apply physical results who has not himself studied the methods by which these results are obtained, either by the royal road of work in a physical or technical laboratory, or by the hard and uphill method of self-education in the making of technical experiment. . . . Hence the importance of the knowledge of how to make accurate observations," which is a thing quite apart from the knowledge of the actual figures to be obtained by such observations. It is a matter of common experience that, among persons who possess what is popularly called a "mechanical" or "inventive" turn of mind, the proneness to indulge in what is supposed to be "experiment" is frequently unattended by the smallest capacity for understanding the results, or drawing sound inferences from such experiment.

Lastly, Dr. Kennedy took care to make it clear that he recognizes that "an engineer's life is not made of experimentation, and that the work of *doing* is even higher than that of *measuring*." But measurement precedes, accompanies, and marks the fulfilment of creative work, and is, in a very positive sense, science itself. Hence it was worth while to devote a "James Forrest" Lecture to the presentment of its claims upon the engineer; and it is only due to Dr. Kennedy to testify to the splendid manner he accomplished this desirable object.

THE PORTSMOUTH CORPORATION AND THE WATER-WORKS.

THE renewal of the spasmodic negotiations between the Portsmouth Corporation and the Portsmouth Water Company really seems likely to bring the question of purchase of the water-works to a definite issue at no distant date. It cannot be said that the matter has been pressed forward with unbecoming haste. Everybody has had ample opportunity for reflection; and it is high time that the question of "Purchase or no purchase?" should be explicitly settled one way or the other. So far as the Corporation and the Company are concerned, the basis of bargain appears already to have been mutually agreed upon, subject to confirmation by the shareholders; the only details still unsolved being the terms of compensation to be paid to the Directors and to the Company's officers other than the Secretary. This gentleman was the principal founder of the Company; and throughout its long and prosperous career, he has been the adviser of the Board. It is agreeable, therefore, to note the general consensus of opinion that his services should be recognized by retiring him on full pay, or allowing him a sum equal to the purchase-money of an annuity corresponding with his present salary. As to the other officials of the Company, most of whom would doubtless be continued in employment, the bonus which the Directors wish them to receive is regarded by the Corporation as uncalled for; and it also appears to be thought that, if the Directors receive seven years' fees, they will be well compensated for the loss of their present emoluments. It can hardly be doubted that upon these two open questions a *modus vivendi* will be discovered. Then, of course, the voice of the ratepayers must decide whether the purchase is to proceed.

The estimate of local men is that consolidated stock approximating to £1,040,000 will be required to provide the purchase-money and the incidental expenses of the transaction. Then comes the oft-discussed point as to the period within which the stock will have to be redeemed. That is a question which the voice of the ratepayer cannot settle. Parliament alone can decide. But though, in one way or another, the normal term of sixty years may be expanded, it is not easy to see where special reasons arise in the Portsmouth case for extending the redemption period to anything like ninety years. That was the term allowed when the Sheffield Water-Works were taken over; but the position there was altogether different and exceptional.

Moreover, as we have previously pointed out, Mr. Leonard Courtney, the then Chairman of Committees of the House of Commons, carried the House with him in the expression of opinion that the Sheffield case should not be regarded as a precedent. The Portsmouth authorities should consult the pages of "Hansard" as to what took place in Parliament on that occasion. It comes to this, according to local calculations, that, if the Corporation can borrow the purchase-money for ninety years, there will be a profit. If the period is fixed at eighty, or even eighty-five years, there will be an annual loss. Even so, it may be asked, will the Portsmouth Corporation, or the Portsmouth public, be wise if they allow the purchase to fall through? Already their supineness has had the inevitable result of adding largely to the purchase-money which the Directors are entitled—and in fact bound, as representing the shareholders—to require. The figures will continue to be progressive so long as the rateable value of the borough advances; and the obvious moral is that, the longer the Corporation postpone the purchase of the works, the worse it will be for the ratepayers.

OBITUARY.

Mr. R. Oakes, an architect of Swaffham, and a Director of the Swaffham Water Company, died recently at the age of 82. He was for many years Surveyor of the County Bridges for Norfolk.

Mr. L. H. Firth, one of the founders of the Heckmondwike Gas Company, and until a few years ago one of the directorate, died last Friday week. The deceased, who was 89 years of age, was a member of the School Board and of the old Local Board.

PERSONAL.

Mr. C. R. Scott, of Dunfermline, has been appointed Manager of the Birnam Gas-Works.

Mr. Robert Gault, of Wicklow, has been appointed Gas-Works Manager to the Bangor (Co. Down) Town Commissioners. There were 79 applicants for the post.

Mr. F. W. Cross, who succeeded Mr. W. Thorman as Manager of the Lea Bridge Gas Company, and Mr. D. Irving, of Bristol, were last Tuesday elected associate members of the Institution of Civil Engineers.

Mr. R. G. Coombe having resigned his position as Chairman of the Burnham-on-Crouch Gas Company, on account of ill-health, Dr. G. Coombe, J.P., has been appointed to the position; and Mr. P. Richmond has been elected Vice-Chairman.

Mr. H. Hawkins has been presented by the employees at the Gomersal Gas-Works (which he is leaving to take up his duties at Todmorden) with a timepiece and side ornaments as a mark of esteem. They were accompanied by a silver watch and chain for Mrs. Hawkins.

Mr. S. E. Bark, son of Mr. S. Bark, the Manager and Secretary of the Godalming Gas Company, has been selected, out of ninety candidates, to fill the position of Manager of the Sunbury Gas-Works. Mr. Bark is at present managing the works of the Tenterden Gas Company.

Mr. J. F. Bromley, the Engineer and Secretary of the Batley Corporation Gas-Works, has had his salary advanced from £300 to £325 per annum, with a prospective further increase of £25 per annum in two years, subject to his undertaking not to apply for a situation elsewhere without the consent of the Corporation.

As will be seen by the report which appears in another column, the Leeds County Council have adopted a recommendation of the Gas Committee, and increased the salary of the General Superintendent of the Gas Department (Mr. R. H. Townsley) from £300 to £500 per annum. Apart from pecuniary considerations, this advance is specially gratifying to the recipient from the fact that it was the result of a unanimous vote both in the Committee and in the Council. Mr. Townsley assumes the sole control of the undertaking under somewhat improved financial and general conditions. The price of gas has been reduced, meter-rents have been abolished, and the profit realized last year has enabled the Corporation to clear off an accumulated deficit of £32,000. Leakage has been brought down by 2¼ per cent. to 5¾ per cent., which is the lowest point yet reached in Leeds, and is certainly not high for nearly a thousand miles of mains. Mr. Townsley has induced the Gas Committee to put down stoking machinery at the New Wortley works; and a large installation of inclined retorts is to be erected at the Meadow Lane station.

Street Lamp-Posts.—A correspondent of "Notes and Queries" contrasts the ordinary lamp-posts of London streets with those in Paris; the latter being electrotyped in copper on a cast-iron core, representing vine-garlands twined around a central stem. The very same lamp-posts may be seen, he says, in and about the South Kensington Museum; and they are there because they were designed for that quarter by the late Mr. Godfrey Sykes. He adds, on the late Sir Henry Cole's authority, that the French were so taken with the design that they borrowed the moulds, and have multiplied them in thousands.

NOTES.

Tests of Anemometers.

M. Rotch, who has an observatory at Blue Hill, Massachusetts, has been investigating, between 1892 and 1894, the behaviour of various forms of anemometers, with the object of determining the mean differences between anemometers used as standards in different countries, and to compare the results of recent whirling-machine experiments. The observatory in question is well suited for the purpose; being situated upon an isolated hill, and equipped with anemometers of the best known patterns. The general result of the experiments is to show conclusively that the smaller anemometers are the most sensitive to sudden variations of velocity; the ratio of sensitiveness being nearly proportional to the size, in instruments of the same type. The fan anemometers are much more sensitive than the cup anemometers, and are therefore the most efficient for recording gusty winds. The Robinson pattern instruments, mostly used in this country, are least efficient in this sense; while they possess undoubted advantages for recording mean velocities. The Dines pressure-tube anemometer was found to be an excellent instrument, especially for indicating maximum velocities. It is considered that the comparisons clearly show the need of some standard form of anemometer, to which all observations hitherto made can be reduced.

The Candle Power of Röntgen Rays.

Mr. Edward P. Thompson has communicated to the "Electrical Engineer" a statement of the results of some experiments made by him in order to obtain a rough idea as to the strength of the Röntgen rays, as compared with those of a standard candle. He admits that the process will not give a true candle power, for the simple reason that the Röntgen rays are not visible as light; but he considered nevertheless that what may be termed the equivalent of the candle power of the rays in question could be measured. The result impresses one with the extreme weakness of the rays in one sense, although they possess so great a penetrating power. In order to obtain the best results roughly, Mr. Thompson receded from the Crookes tube while looking into the "skiascope," as Professor Magie has termed the instrument employed in these investigations, until the luminosity disappeared. The distance between the phosphorescent screen and the Crookes tube was then about 6 feet. He then held the skiascope so as to face the candle; and again receded until the luminosity of the screen illuminated by this means disappeared. The distance in the latter case was about 120 feet. If, therefore, the power of the X-rays in producing fluorescence varies, like light, inversely as the square of the distance, it follows that a candle is 400 times more powerful than the particular source of these rays used for the comparison. This comparison assumes two things—first, that the effect on the fluorescent screen represents the total energy of the X-rays in use; and, secondly, that all the candle rays are converted into fluorescent light. The latter is certainly not the case, inasmuch as the rays below the green—including yellow, orange, red, and infra-red rays—take no part in producing the luminosity of the fluorescent screen; and it is not known that all the rays of higher refrangibility are converted into luminous effect in this way. Neither would a corresponding photographic method be exact. It remains true, however, that so far as these different energies are transformable by the action of the fluorescent screen, the X-rays are weak as compared with those from the candle. Both are capable of producing fluorescence and chemical action, but the candle very much more powerfully than the X-rays.

Impervious Reservoir Linings.

Having to construct a reservoir for the water supply of the town of Astoria (Oregon), Mr. A. L. Adams undertook to solve the problem of lining the excavation with something that would, at a reasonable cost, fulfil the following somewhat "ideal conditions," as he describes them in a paper read before the American Society of Civil Engineers. It should not readily break down over slight local settlements; if it did break down, the impervious surface should bend down, and not break. It should not crack from expansion and contraction; but if it did crack, no leakage should occur. It should be permanent; and, finally, it should be practically water-tight. The author says he has tried reservoir linings made by laying brick dry on a layer of coarse underdrained gravel, and then coating it with asphalt; of asphalt mastic covered with asphalt; and of asphalt directly on concrete. All have proved sufficient for the purpose, and some of them especially useful as expedients where large results were required from small expenditures. But he feels that the lining adopted for the work in question more nearly meets all the requirements of an ideal reservoir lining than any other with which he is familiar. It consisted, first, of 6 inches of Portland cement concrete, laid with expansion joints—that is to say, in squares of 20-feet sides on the bottom, and 10-feet sides on the slopes. These squares were formed of 6-in. by 2-in. planking. As soon as the concrete was laid on the bottom, the planks were removed and replaced by ½-inch weather boarding, and ⅜-inch of cement mortar floated over the whole. A fortnight later these boards were drawn, and a first coating of medium hard asphalt laid flush over all. Next came a layer of brick on the flat, dipped in hot asphalt; and a finishing coat of asphalt was laid over all. The expansion joints prevented all cracking.

Mr. Adams makes the observation that "it must not be assumed, as has been so often stated, that asphalt renders anything wholly impervious to water, or is itself impervious. On the contrary, it may be readily demonstrated by a simple experiment that a brick thoroughly coated and re-coated will in time absorb as much water as an uncoated one. The advantage of the asphalt lies in its retarding effect on the passage of water; it does not exclude it.

A Chain Compensated for Temperature.

According to the "Engineering Record," a patent has just been granted for a chain so constructed as neither to expand nor contract, as a whole, through variations of temperature. The principle relied upon to effect this result is that of the gridiron pendulum; and its application to this particular purpose consists in the interposition between the overlapping links of the chain of bearing-pieces, made of some metal possessing a larger co-efficient of expansion than the iron or steel of which the links themselves are composed. Having regard to the ratio of these co-efficients and the respective lengths of the bearing-pieces and links, it is possible to construct the chain so that it will maintain exactly the same length between its extremities, no matter what changes of temperature, in reason, are brought to bear upon it. Various applications of such chains to structural purposes are suggested; among others that of imbedding chains in and winding them about masonry structures, in which case the component members would be so proportioned as to give the same co-efficient of expansion as that of the masonry itself. Since the compensating bearing-pieces are always in compression, any lack of tensile strength in the material of which they were composed would not weaken the chain. The idea is ingenious, and is susceptible of more modifications—as in the guiding of gasholders and many other applications—than appear at first sight.

Pipes at the Antipodes.—The New South Wales Minister for Works has, says "Engineering," decided to accept a tender of Messrs. Pope, Maher, and Co., for the supply of a quantity of 20-inch wrought-steel pipes for the Walka to Buttai duplicate rising-main in connection with the Hunter district water supply; the contract price being £15,920. The tender provides for making the pipes in New South Wales at 21 per cent. below schedule prices. The lowest tender for imported goods of the same character was 21½ per cent. below schedule prices. There was thus only ½ per cent. in favour of the imported price, as against that of pipes to be made in the colony; and it has been reported that this small difference would be considerably more than lost by the extra cost of inspection in connection with the imported pipes, and also that pipes would probably be knocked about more if they were imported than if they were made in the colony.

The Royal Society's Conversazione took place last Wednesday, and was attended by a large and distinguished company, who were received by the President (Sir J. Lister). The exhibits were, if anything, more interesting than in previous years; the "new photography" introduced by Professor Röntgen constituting a very attractive novelty. Professor Clowes showed the apparatus which, in conjunction with Mr. Boverton Redwood, he has devised for detecting the presence of gas in electric light culverts or other places where it is liable to cause explosion. The appliance has been described in the "JOURNAL;" and it was shown to the members of the North of England Gas Managers' Association at their recent meeting. The Committee of the Royal Society appointed, by request of the Home Office, to investigate gas cylinders, having special reference to the explosion at Fenchurch Street Station some months since, exhibited a number of damaged and broken cylinders resulting from the experiments made.

Hydraulic Rotative Engines.—This formed the subject of a paper read at the meeting of the Society of Engineers, at the Royal United Service Institution, Whitehall, on Monday, the 4th inst., by Mr. Arthur Rigg, Past-President. The paper was devoted to the subject indicated in the title, and took no account of any other class of hydraulic motor. Comparison was made between the great literary interest given to turbines and the paucity of such interest concerning hydraulic engines; also between the great attention devoted to economizing steam, and the little that has been done towards economizing pressure water which, as a source of power, is far more costly than steam. The author next proceeded to describe all the principal types of hydraulic rotative engine by Armstrong, Westmacott, Brotherhood, and many others. This historic portion of the paper was followed by a theoretical examination of the variations which occur in the tangential driving effort of different kinds of engines, illustrated by diagrams; and these showed how the peculiar behaviour of some of these engines can be accounted for. The loss of useful effect by contracted passages was next noticed; and the last portion of the paper was devoted to the theory and construction of the revolving cylinder type, together with the author's improvements whereby hydraulic engines are now constructed so that they can be governed automatically, and thus no longer need to use the full amount of water as if working to their maximum power, when doing little or nothing, but are governed for the first time in the history of hydraulic engines so as to work with an economy as scientific and complete as any steam-engine.

TECHNICAL RECORD.

THE COST OF PRODUCING CALCIUM CARBIDE.

[From "Progressive Age."]

The issue of the above-named paper for the 15th ult. contains a special report of a party of Commissioners appointed by the paper to inspect and test the working of the carbide of calcium factory at Spray, North Carolina, with the object of ascertaining the cost of this interesting product of electro-metallurgy. The Commissioners were Professor E. J. Houston, the well-known co-adjutor of Professor Elihu Thomson in the invention of the electric lighting system which bears their joint names; Dr. A. E. Kennelly, another electrician; and Dr. Leonard P. Kinnicutt, as chemical expert. The factory in question is the original one established by the Willson Aluminium Company; and the product is expected to be manufactured under much more favourable conditions at Niagara Falls by the new Carbide Company. Inasmuch, however, as carbide of calcium is carbide of calcium, wherever made, the results obtained at Spray should only need to be corrected with reference to local industrial data to hold good anywhere.

The technical character of the manufacture as carried on at Spray is fairly described by the paper of Messrs. Morehead and de Chalmont—an abstract of which appeared in these columns last week, p. 976. The report of the "Progressive Age" Commissioners does not add anything material to the information already published by these writers. Its independent value begins with an account of two complete runs made with the same furnace, on March 16 and 17. In each run the mixture put into and withdrawn from the furnace was weighed and carefully sampled, as was also the yield of calcium carbide. All the samples were analyzed at the Polytechnic Institute of Worcester, Mass. The supply of electricity to the furnaces was also measured. In the first run, 1200 lbs. of lime and 800 lbs. of coke were put into the ball-mixer. The lime analyzed as follows:—

Water and carbon dioxide	4·550
Silica	0·280
Phosphoric acid	0·014
Iron and aluminium oxides	1·580
Calcium oxide	88·860
Magnesium oxide	4·270
Alkali, sulphuric acid, and loss	0·446
	100·000

The analysis of the coke gave—

Moisture	0·400
Ash	8·600
Sulphur	0·480
Phosphorus	0·005
	9·485

(Since only the percentages of impurities are given by our contemporary, the balance—or 90·514 per cent.—must be taken to be carbon.) Of the 2000 lbs. of material ground in the ball-mixer, 1903 lbs. was put into the furnace; thus showing a loss of 97 lbs. in mixing and handling. This mixture was again analyzed, as follows:—

Calcium oxide	995·6 lbs.	=	52·32 per cent.
Carbon	709·9 ,,	=	37·30 ,,
Residue (impurities and moisture)	197·5 ,,	=	10·38 ,,
	1903·0 lbs.	=	100·00

The furnace run for the reduction of this charge lasted three hours. The mean total primary current was 156 ampères; and the mean pressure, 1000 volts. This was transformed to a secondary current of 1560 ampères and 100 volts, as actually supplied to the furnace. Allowing for a loss of 5 per cent. in the transformers, this corresponds to a consumption of 193·1 horse power of energy. Next morning the furnace was emptied, when 226·5 lbs. of calcium carbide was recovered, with a residue of 1332 lbs. of unconverted material. The carbide was coated with a slag estimated to weigh 10 lbs., which left 216·5 lbs. as the net weight of carbide produced. This yielded from an average sample, and as a mean of four determinations, 4·773 cubic feet of moist acetylene gas at a pressure of 30 inches of mercury, and a temperature of 60° Fahr. Analysis of the unconverted mixture showed that the carbon had wasted slightly more than the lime. The second run was made with nearly the same weights of raw materials, of practically the same composition; the charge being, however, richer in lime (54·86 per cent.) and poorer in carbon (34·13 per cent.). The charge weighed 1891 lbs.; and the net resultant carbide, 193 lbs. This yielded on the average 5·09 cubic feet of moist acetylene per pound. The result of the two runs, in which 3794 lbs. of raw material was charged, sums up as follows:—

Calcium carbide made	409·5 lbs.
Slag	20·0 ,,
Carbon withdrawn	950·3 ,,
Calcium oxide withdrawn	1515·7 ,,
Residue	304·0 ,,
	3199·5 lbs.

The consumption of raw materials was 1·18 lbs. of coke and 1·40 lbs. of lime per pound of net carbide made. The expenditure of energy is worked out in various ways. It amounted to

a production of 0·3905 lb. of gross, or 0·3723 lb. of net carbide per furnace horse-power-hour. The production, reckoned in moist acetylene gas, was after the rate of 44·01 cubic feet, at standard temperature and pressure, per furnace horse power per day. (The meaning of the last figure is not very clear.)

Respecting the large waste of raw material in the manufacture, the report observes that much of this is due to the crude methods of preparation and handling inseparable from the working of an experimental plant. The acetylene gas was of a high degree of purity, being found on analysis to contain only traces of phosphide and sulphide of hydrogen. Neither free hydrogen nor arsenide of hydrogen could be detected. The gas evolved in the process of reduction contained: Carbon dioxide, 7·6 per cent.; carbon monoxide, 76·0 per cent.; nitrogen, 16·4 per cent. With regard to the approximate cost of manufacturing calcium carbide, the report estimates this at a fraction over $20 per ton of 2000 lbs.—taking one horse power as costing $5 per annum at the turbine shaft, coke at $2·75 per ton, and lime at $2·50 per ton (both delivered), upon an output of 5 tons of carbide per day. These conditions are admitted to be very favourable; but the reporters regard them as realizable.

THE PRODUCTION OF STEAM AND POWER.

By W. Stagg.

[A Paper read before the South-West of England District Association of Gas Managers.]

To produce, convey, and use steam with economy, merits our attention from a commercial, as well as from a scientific point of view, and necessitates an occasional test. The object of a test being to ascertain whether the amount of fuel used per horse power might be lowered, it is necessary to test the engine and boiler separately. A comparison of the figures thus obtained with a recognized standard of efficiency, would in many cases, I venture to think, be a humiliating revelation.

Twenty-one tests upon half-a-dozen different types of boilers, recently concluded by Mr. Bryan Donkin and Professor Kennedy, upon a uniform basis, result in placing a Cornish boiler at the head of the list for good work; a Lancashire coming in third. There can be no doubt about the adaptability of this type for the steam supply in a gas-works. The Cornish boiler referred to was hand-fired by the boiler owner's ordinary fireman; the combustion per foot of grate area very slow, with a natural chimney draught equal to 0·47 inch water column, and the flue gases at the base of the chimney at a temperature of 485° Fahr. Its thermal efficiency proved to be 78·125 per cent.—that is to say, 78·125 per cent. of the total heat in the fuel was utilized in converting the feed water into steam.

To determine the thermal efficiency of a boiler, it is first necessary to know the thermal or heat value of the fuel. Then, again, the work done upon the feed water requires to be expressed in some uniform standard, because of variations in the temperature of the feed water and pressure of the steam. The standard usually adopted is 1 lb. of water at 212° Fahr. raised to steam at 212° Fahr.—viz., the latent heat of steam, 966 thermal units. Where accuracy is required, the thermal value of the fuel must be obtained by using some form of calorimeter, or by analyzing the fuel; this heat-value is expressed in terms of its carbon value.

For complete combustion, pure carbon gives out the heat required to evaporate 15 lbs. of water from and at 212° Fahr. A good Welsh steam coal may be set down at 16 lbs.; gas coke, as ranging from 14 to 15½ lbs.; and breeze, say, 12 lbs. These figures are never realized in practice. Losses arising from moisture, imperfect combustion, escape of heat in the flue gases, from exposed surfaces of the boiler, through the brickwork of the setting, and bad circulation of the water in the boiler, all detract from the value of the fuel. So it comes about that the highest efficiency in the tests referred to accounted for only 78 per cent. of the heat-value in the fuel; while in the lowest recorded—that of the boiler of a steam fire-engine—only 51 per cent. was usefully employed in evaporating the feed water. It is the duty of the engineer to reduce these losses to a minimum.

We have to aim at perfect combustion of the fuel, with the least admixture of air necessary to ensure it. The amount, however, is always greater than that required to satisfy chemical combination. A high temperature in the furnace, and a low one in the chimney, are the *desiderata*. One pound of carbon burnt to carbon dioxide, yields 14,544 English thermal units, as against only 4451 when burnt to carbon monoxide; and a serious loss would therefore arise from an insufficient air supply, brought about by too great a depth of fire. On the other hand, a fire too shallow for its draught may be chilled by an excess of air, which in its turn increases the weight of heated material escaping up the chimney. In many of the Donkin tests referred to, no trace of carbon monoxide was found in the flue gases, indicating perfect combustion; but in one case, it reached 2·77 per cent. by volume. To the gas manager, this question of testing the furnace gases is a simple one, and ought to be resorted to in order to determine the best working conditions.

Where a boiler is too small for its work, the temperature of the escaping flue gases may be abnormally high, owing to the forcing of the fires and insufficient heating surface. Much of this heat could be recovered by the introduction of an economizer—*i.e.*, a series of cast-iron pipes placed vertically in the main flue—through which the feed water is pumped on its way to the boiler, raising the temperature about 150° Fahr. The saving in fuel resulting from the use of these economizers ranges from 10 to 15 per cent., while they increase the steaming power of the boiler to the same extent.

A dirty boiler and flues is another fruitful source of waste—scale on the water side of the plates of tubes and shell and dust on the flame surfaces, both bad conductors of heat. I have found the efficiency of a boiler impaired to the extent of 10 per cent. after being continuously worked for 30 days only; and this with water that had been filtered, and was moderately free from lime salts (sulphate and carbonate). Where much trouble arises from the presence of these salts, the water should be analyzed before deciding on di-incrustant or boiler compositions, some of which are injurious. A stand-by boiler is always necessary in a gas-works, where the boiler in action is worked continuously, in order to facilitate regular and periodical cleaning and examination.

Effect of Dirty Boiler.

Condition of Boiler.	Pounds of Water Evaporated per lb. of Combustible. With Breeze.	With Coke.
Clean	7·56	9·06
Dirty (after working 30 days) . .	6·76	8·15
Difference	0·80 = 10·5 p.c.	0·91 = 10·4 p.c.

The record given here of actual boiler performances opens up the question of fuels. The figures were obtained from a Lancashire boiler, having an efficiency of 70·56 per cent. when clean, and evaporating 3 lbs. of water per hour per square foot of heating surface. From the column giving the pounds of water evaporated for 1d., it will be seen that gas-works breeze, if moderately dry, is the cheapest fuel. This was burnt with a natural chimney draught of from 2-10ths to 3-10ths of an inch water column at the base of the chimney, and at the rate of 8·8 lbs. per square foot of grate-area per hour.

For the sake of completeness, I have added results from other substances, which have been kindly placed at my disposal. The figures for creosote were supplied by Messrs. W. Butler and Co., of Bristol. Two examples are given. In one, creosote alone was used, burnt in a brick oven about 4 ft. by 3 ft. by 3 ft., placed in front of the boiler-tube; the tube itself being lined with brickwork 2 ft. 3 in. from the front of the boiler. In this case, 10·3 lbs. of water were evaporated, from and at 212° Fahr., for one pound of creosote. In the other example, the creosote was sprayed into the ordinary grate on to the top of a gas-coke fire; the space beneath the bars being nearly closed, admitting just sufficient air to keep the fire free from smoke. Allowing 7·47 lbs. of water for the coke, the evaporative value of the creosote works out at 9·37 lbs. This figure is less reliable than the previous one; but the figure stating the commercial value of coke and creosote as a fuel combined may be relied upon, and decides the question in favour of burning it without coke in the external brick chamber. The boiler was a 5 ft. 6 in. Cornish one, 18 feet long, with a

Evaporative Value of Fuels—Thermal Boiler Efficiency 70·56 per cent.

——	Breeze.	Poor Quality Coke.	Coke from Welsh Coal.	Welsh Gas Coal.	First Quality Cannel Coke.	Nixon's Welsh Steam Coal.	Creosote.	Creosote and Coke.	Ashpan Breeze.	Town Refuse.
Percentage of ash and clinker . .	16·4	20·3	7·28	6·85	9·4	6·03	..	..	..	.. Worst condition of Working.
Pounds of water evaporated per lb. of fuel from and at 212° Fahr. .	6·31	7·22	8·22	8·30	8·40	9·58	10·30	Coke 7·47	3·0	1·75 Best Condition.
Pounds of water evaporated per lb. of combustible	7·56	9·06	8·86	8·91	9·27	10·20	..	9·37 Creosote	..	0·51 0·35
Price of fuel on works, per ton . .	3s. 4d.	8s. 4d.	8s. 4d.	..	8s. 4d.	..	10s.	10s.	..	..
Pounds of water evaporated for 1d.	353·3	161·7	184·1	..	188·16	..	192·96	147·0 Creosote	..	..
Price of fuel in the town, per ton .	5s. 10d.	10s. 10d.	10s. 10d.	12s.	10s. 10d.	16s. 6d.	20s.	20s.	..	..
Pounds of water evaporated for 1d.	201·92	124·46	141·63	129·1	144·7	108·3	103·3	..	..	..

2 ft. 9 in. tube, without cross tubes or "Galloway pots." The fire returns under the bottom, then divides, and passes back both sides to the chimney. I need hardly say that at the present price—20s. to 25s. per ton—creosote is placed out of reach as a fuel.

Town refuse from ash-bins may, at first sight, appear to stand well; but the statement needs qualifying. This material of necessity requires a special type of furnace of an expensive kind, known as a destructor; its primary purpose being to destroy rapidly all unscreened town refuse, without offence or nuisance. The utilization of the waste heat of these destructors for the generation of steam is limited by the consideration that efficient performance of its primary function shall not be impaired; and therefore the boiler cannot be placed over the hottest part of the fire. The second figure—0·54 lb.—represents the value of such a fuel after satisfying this condition. Secondly, for the performance of its work a forced draught is necessary—practice says a steam-jet, which uses $\frac{7}{18}$ of the total 0·54 lb. generated; leaving only 0·31 lb. as fuel value per pound of refuse for external work. My excuse for dwelling on this question of town refuse arises from the suggestion—perhaps never very seriously made—of utilizing this waste heat to generate electricity for a town supply. I will leave you to settle how far it is practicable.

With a limited boiler power, some form of forced or induced draught becomes necessary, if breeze is to be burnt; the simplest method being the well-known plan of delivering air under pressure into closed ash-pits, either by means of a blower or steam-jet. I regret, however, that I cannot give any figures from my own experience. I have seen it stated that, with ash-pan breeze from gas-works, containing equal percentages of moisture, clinker, and combustible, 3 lbs. of water have been evaporated per pound of this breeze. A cheap fuel, if such be a fact!

The escape of heat resulting from the conveyance of steam from the boiler to the various engines, pumps, &c., may become a serious item, where the pipes are carried long distances, and are exposed or imperfectly covered. There are plenty of figures published in technical works, showing the advantage of protecting steam-pipes; but apart from the loss of energy by condensation in its passage, the steam is supplied to the cylinder wet—water dust, someone has called it. More will be said later on of the miserable effect of wet steam in the production of power. Pipes should always be kept freed from water by drain-taps or traps fitted where necessary.

The following table of substances of widely different character which I have somewhat recently tested, may be of use. In selecting a material for steam-pipes and the like, the tenacity and durability of the substance should be considered. The material manufactured by Messrs. Lawson and Co., of Bristol, is a first-class one, and is capable of being moulded into blocks for special purposes.

Non-Conducting Coverings for Boilers and Steam-Pipes.

Steam pressure, 65 lbs.
Temperature of boiler-plate, 270° Fahr.
" air, 80° Fahr.

	Thickness in Inches.	Stationary Temperature.
Glass wool	3	110° Fahr.
Bristol boiler covering	3	113° "
Asbestos covering	3	114° "
Ashes, plaster, and fire-clay	3	118° "
Felt, with iron plate	1½	126° "
Ordinary boiler composition	3	131° "
Spent lime	3	133° "
Studded bricks, 1⅛-in. air-space	3¾	145° "
Thin iron plate, with air-space	2	169° "

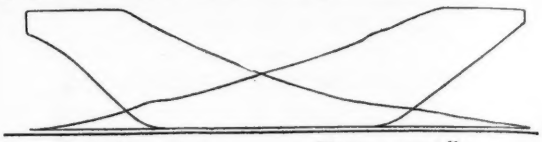
Spent lime provides a cheap and convenient material where steam-pipes are laid in the ground in brick-lined trenches; but caution should be exercised where there is the least suspicion of calcium sulphide being present in the lime.

Having produced our steam, let us see how we can most economically obtain power. A high boiler pressure greatly increases the efficiency of an engine; and where there is a plentiful supply of cold water, a condenser would be a source of considerable economy—especially if the works' water supply were passed through a surface condenser on its way to the coke-yard. Why is it one so rarely meets with a condensing engine in a gas-works? The advantage here mentioned may be shown by calculating the mean effective pressure on a steam-piston for equal weights of steam used; the size of the cylinder and terminal pressure being the same in each case. The mean effective pressures thus obtained give the relative indicated horse power, theoretical, for equal weights of steam, thus:—

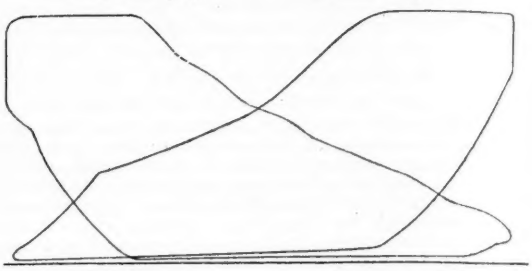
Description of Engine.	Boiler Pressure Pounds above Atmosphere.	Absolute Pressures Pounds per Square Inch.		
		Terminal Pressure.	Back Pressure.	Mean Pressure.
Non-condensing	30	20	17	19·045
" "	80	20	17	34·000
Condensing	30	20	4	32·000
"	80	20	4	47·015

From this it will be seen that one may nearly double the indicated horse power of a given engine, by either adding a condenser or using a high boiler pressure; the result being attained with practically the same expenditure in fuel. It is quite true that the whole tabulated increase is not available for external work, because the higher boiler pressure necessitates a higher grade of expansion, with a corresponding increase in cylinder condensation; and in the other case, the air-pump absorbs a part of the increased power. Nevertheless one might safely reckon on a large gain in either instance.

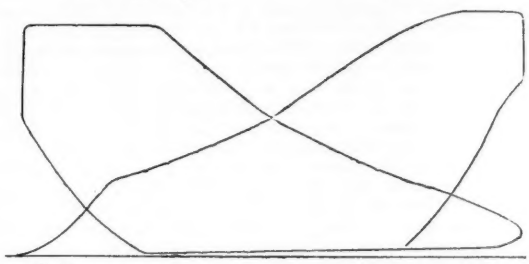
In studying the behaviour of steam in the cylinder of an engine, indicator diagrams become indispensable. These monitors afford a means of ascertaining whether the valves are correctly set; the horse power of the engine; and by far the most important piece of information, as bearing on the fuel account—the weight of steam used per horse power. In order to discuss this question, I have taken a set of diagrams—not because the results are ideal—from an ordinary slide-valve high-pressure engine, coupled directly to the exhauster.



1 H. P. = 5·45. Steam = 35·2 lbs.



1 H. P. = 10·4. Steam = 28 lbs.



1 H. P. = 15. Steam = 28·56 lbs.

FIGS. 1, 2, 3.—EXHAUSTER ENGINE.

No. 1, taken with the gas-exhauster uncoupled, gives the horse power required to overcome the friction of the engine; No. 2, the power required to drive the engine and exhauster without work; No. 3, the total power required to deal with about 50,000 cubic feet of gas per hour, while the calculated theoretical net energy required to move the gas at the pressures indicated by the gauges works out at about 4-horse power. The mechanical efficiency of the whole machine is not a thing to boast about. Unfortunately, at a gas-works the greatest efficiency can only be obtained for a few weeks in the depth of winter, when the engine is fully loaded. The steam consumption per indicated horse power has been worked out, and is written on the diagrams; but it must be borne in mind that the actual feed consumption is always higher than that shown by the diagram. Diagram No. 4, from the same engine, has been prepared for analysis by drawing the hyperbolic curve of expansion. The somewhat large amount of compression, obtained in this case by shortening the throw of the eccentric in order to improve the grade of expansion, enables the weight of steam used per indicated horse power per hour to be calculated immediately from the diagram, without knowledge either of the size of the cylinder or the speed of the engine. The compression of a portion of the exhaust diminishes the loss due to clearance, and aids in bringing the reciprocating parts of the engine quietly to rest at the end of each stroke.

Reverting to the set of three diagrams, the steam consumption of No. 3 works out by diagram at 28·65 lbs. per hour. Now, during the period of this test, the feed water was being carefully measured; and it turns out that the actual consumption was 39·24 lbs. The figures stand thus—

Steam per indicated horse power hour by feed	41·24 lbs.
" " drained	2·00 "
" " available for work	39·24 "
" " by diagram	28·65 "
Unaccounted for by diagram	10·59 "

The piston was known to be tight; therefore condensation in the cylinder is to be held accountable for, and actually wasted in this case, 27·2 per cent. of the steam which entered the cylinder.

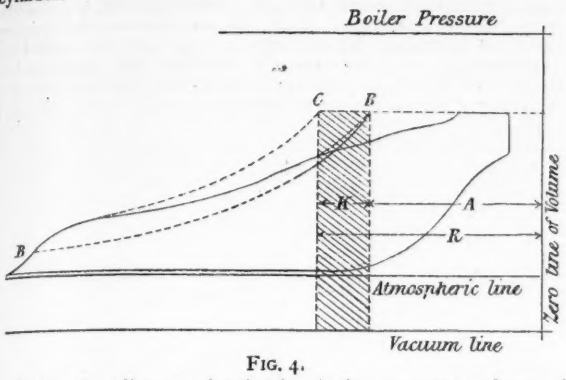


FIG. 4.

In fig. 4 is a diagram showing by A the apparent volume of steam which enters the cylinder up to the point of cut-off. The hyperbolic curve of expansion B shows that this is not the real point of cut-off. The curve C, originated from the final pressure in the cylinder, shows that the actual cut-off occurs at C; and this agrees with what was known in regard to the slide-valve. The real volume of steam which entered the cylinder is therefore R. This tells us that K volume has been re-evaporated during expansion; and by a measurement of the actual feed water, we have to draw a line to the left again of K, showing still greater initial condensation, for the diagram cannot show the evaporation going on during the exhaust stroke. Volume K is the minimum that can have been condensed (the tightness of the valves and piston is assumed). This volume K disappears, and re-appears at every stroke; its only duty being to convey heat from the furnace into the exhaust-pipe without performance of work other than that represented by the area of that part of the diagram above the curve B. A jacket, or superheating the steam, is intended to prevent this loss. The beneficial effect of steam-jackets and superheating becomes less as the piston velocity increases.

The chief cause of cylinder condensation is the wetness of the steam supplied, and may be due to priming or to condensation in the steam-pipes and exposed surfaces of the boiler and cylinder. There is, however, one other cause. During the process of expansion, the steam in the cylinder is liquefied, owing to the loss of heat arising from the conversion of heat into work; and the earlier the cut-off, the greater the loss. Much of this water would be discharged with the exhaust, and would do less harm than water actually entering the cylinder with the steam. The presence of water in the cylinder is most pernicious in the development of power. This water, having no latent heat, is partly re-evaporated by contact with the hot walls of the cylinder; and the cylinder, thus cooled, robs the next charge of steam of some of its heat. Every pound of water which enters the cylinder requires an equal weight of steam to boil it off. In the analyzed diagram, the discrepancy between the theoretical expansion curve and the actual curve of the diagram, together with the lowering of the initial pressure, gives some indication of this waste.

The steam, before entering the steam-chest, should be dried as far as possible, by passing it through a separator drained by some form of steam-trap. The ideal position is actually to bolt it on to the steam-chest. An uncovered cylinder is a barbarism, and yet not unknown. A steam-jacket, properly drained, greatly reduces the evil, though at first sight it would appear merely to transfer the loss of heat from the cylinder to the jacket. Nevertheless a net gain results from thus getting rid of water in the working cylinder. The loss arising, in the use of a steam-jacket, from the unnecessary heating up of the exhaust, would give a decided preference to superheating the steam in its passage from the boiler to the cylinder. Superheated steam is steam at a higher temperature—30° to 50° Fahr. in practice—than that due to its pressure when in the presence of water; and the great advantage it possesses over a steam-jacket arises from the action of the surplus heat in immediately absorbing the film of water from the metal surfaces. The heat is applied exactly where it is required, and during the period of admission only—that is, up to the point of cut-off. Both methods afford considerable scope for economy; there is, in fact, a large gain arising from a small amount of heat applied in counteracting cylinder condensation.

With a high-pressure non-condensing engine, the exhaust steam may be laid under contribution as an economizer, by utilizing the escaping heat to raise the temperature of the feed water. The simplest form consists in passing the exhaust steam through a thin copper pipe surrounded by a belt, through which the feed water passes on its way to the boiler. From 10 to 12 per cent. saving in the fuel account can thus be readily effected.

Before leaving this matter of diagrams from steam-cylinders, two or three points require notice. By calculating the steam per indicated horse power under different conditions of working, and allowing for the condensation due to expansion, we may arrive at the most economical ratio of expansion for a given load; remembering that the increased work obtained by expanding a given quantity of steam may be more than neutralized by cylinder condensation, which increases rapidly as the cut-off gets earlier.

Diagram No. 5 is from the high-pressure cylinder of a Hornsby compound engine, and is a splendid example of good work. It has been the practice of this firm to make portable engines with the cylinders inserted in the boiler—by raising the fire-box shell—thus forming a first-class steam-jacket. The diagrams Nos. 6 and 7 are a pair from a very small engine, showing how bad things may be. The steam, it will be noticed, follows

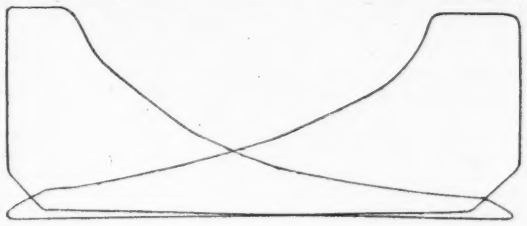
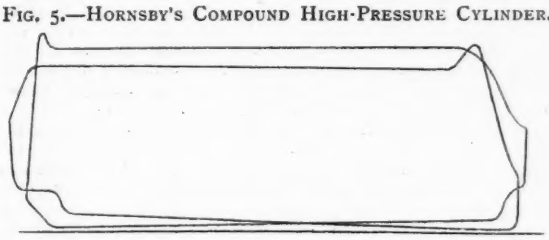
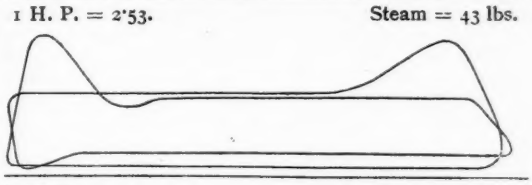


FIG. 5.—HORNSBY'S COMPOUND HIGH-PRESSURE CYLINDER.

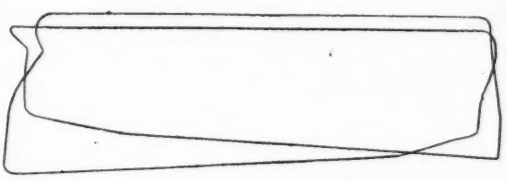


1 H. P. = 2·53. Steam = 43 lbs.



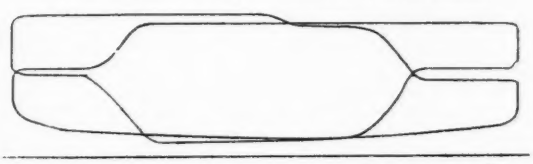
1 H. P. = 3·55. Steam = 108 lbs.

FIGS. 6 & 7.—HORIZONTAL ENGINE. CYLINDER 4 in. by 4 in. 200 REVOLUTIONS.



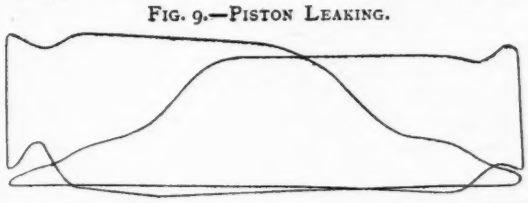
1 H. P. = 1·58. Steam = 78 lbs.

FIG. 8.—STEAM-PUMP. TAPPET-VALVE GEAR.



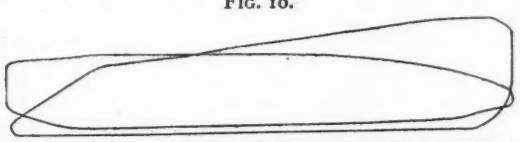
1 H. P. = 1·83. Steam = 101 lbs.

FIG. 9.—PISTON LEAKING.



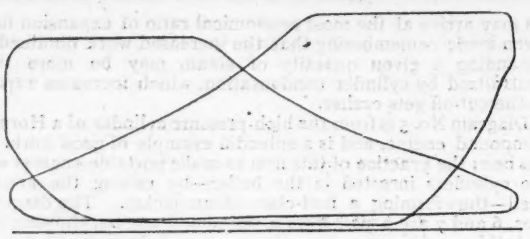
1 H. P. = 3·28. Steam = 46 lbs.

FIG. 10.



1 H. P. = 5·58. Steam = 54·9 lbs.

FIG. 11.—EXHAUSTER ENGINE.

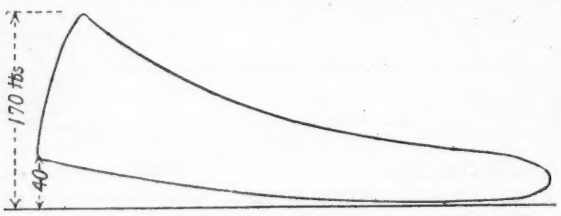


1 H. P. = 10·33. Steam = 42 lbs.

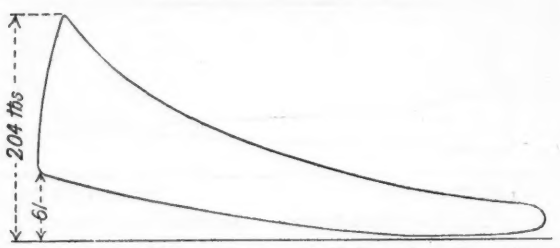
FIG. 12.—EXHAUSTER ENGINE.

the piston to the end of its stroke without expansion, and is exhausted at the initial pressure. The steam consumption, when the engine was working at about one-sixth of its full power, reached the enormous figure of 108 lbs. per indicated horse power hour. But the diagram, No. 8, from a steam-pump of the tappet type, is an even worse example. Nos. 9 and 10 are a pair showing a leaking piston and badly-set valve; the second diagram indicating the improved condition of things after treatment. Nos. 11 and 12 are a pair from a larger exhauster engine, before and after resetting the valve and altering the grade of expansion. The reason why I put these diagrams before you (and here I may say that I have in each instance brought the original diagram for your inspection) is because in no case were these faults shown by any irregularity in the working of the engine. On the contrary, the ordinary engine-fitter looks upon such wasteful engines as being "handy," because they will start at any point of the stroke!

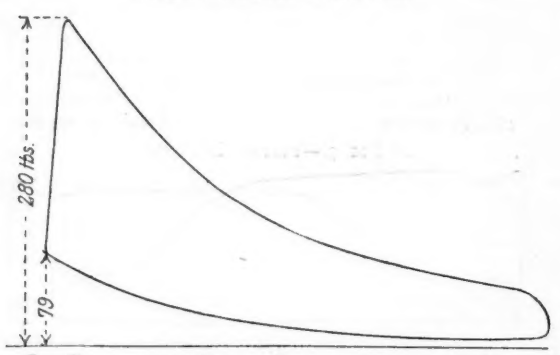
I will conclude with a few notes on two rivals of the steam-engine—the gas and the oil engine. The gas-engine of to-day gives far better results than those obtained fifteen years ago. This has been brought about by a greatly increased mean pressure upon the piston, consequent upon a higher initial pressure; and this higher pressure is the result of a greater compression of the charge of air and gas, and has been made possible by the



GAS-ENGINE 1882 TYPE. GAS PER B. H. P. = 28 CUBIC FEET. MEAN PRESSURE = 71·8 lbs.



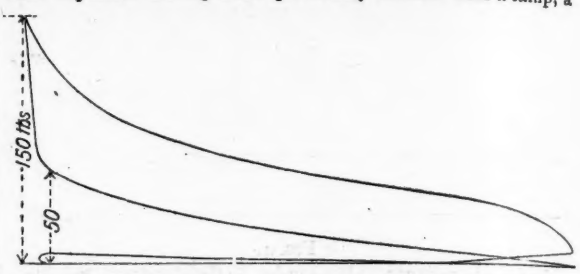
GAS-ENGINE 1888 TYPE. GAS PER B. H. P. = 23·87 CUBIC FEET. MEAN PRESSURE = 68·10 lbs.



GAS-ENGINE 1894 TYPE. GAS PER B. H. P. = 16·487 CUBIC FEET. MEAN PRESSURE = 98·75 lbs.

ntroduction of the hot ignition-tube. The three diagrams, to the same scale, taken in 1882, 1888, and 1894, clearly show this improvement, which has had the effect of reducing the size of the cylinder employed, while, at the same time, the gas consumption per brake horse power has steadily gone down from 28 to 16·5 cubic feet.

The last decade has witnessed the gradual improvement of the oil-engine, which to-day is capable of giving a good account of itself. The following particulars of a recent trial upon a 3-horse power nominal Hornsby-Akroyd engine, manufactured at the Grantham Iron-Works, will serve to illustrate my notes. It has much the appearance of a gas-engine—as will be seen from inspection of the photographs—which, indeed, it resembles in its mode of operation. It has the four cycles so well-known; the chief additional feature being a cast-iron box, called the vaporizer, placed at the back of the cylinder, and connected to it by a neck which is always open to the working cylinder. This vaporizer having been previously heated with a lamp, a



HORNSBY-ACKROYD (3 H. P. NOM.) OIL-ENGINE.
OIL PER B. H. P. = 1·352 PINTS. MEAN PRESSURE = 26·9 lbs.

definite proportion of air and oil are drawn into it. The oil is vaporized; the compression stroke follows; and the charge is ignited at the commencement of the outward stroke, by contact with the hot walls of the vaporizer, which is now kept hot by the repeated explosions. It ran with sufficient steadiness to drive a dynamo supplying the current for some incandescent electric lamps. The oil used was "Royal Daylight"—an American oil of 0·792 sp. gr., with a flashing-point of 81° Fahr.—of which 1·352 pints per brake horse power and 1·019 pints per indicated horse power per hour were used. The cylinder has a diameter of 8¼ inches, and a stroke of 14 inches. The indicator diagram shows a mean effective pressure of 26·9 lbs., from a final compression of 50 lbs.; the mean speed being 206·3 revolutions per minute; the indicated horse power, 5·244; the brake horse power, 3·952, giving a mechanical efficiency of 0·753. Larger sizes are made—up to 40-horse power; and the oil consumption per horse power decreases with the larger engines.

The question of the cost of fuel for the production of power is too important to entirely pass over. I have therefore tabulated some actual results for small engines, in order to make an approximate comparison of the three types under discussion. As the figures are almost certain to be questioned, because of the varying conditions and sizes of engines under trial, I have used the word approximate in the following record:—

Approximate Comparative Cost of the Fuel in the Production of Power.

	Horse Power of Engine.	Consumption of Fuel.		Cost of the Fuel.	Cost of Fuel in Pence.	
		Per Brake Horse Power per Hour.	Per Indicated Horse Power per Hour.		Per Brake Horse Power per Hour.	Per Indicated Horse Power per Hour.
		Lbs.	Lbs.	Per Ton.		
Steam-Engine—						
With Welsh steam coal	10	4·44	4·0	15s.	·35	·32
With coke, in works . . .	,,	5·55	5·0	6s. 8d.	·20	·178
With coke, in the town	,,	5·55	5·0	10s. 10d.	·322	·290
With breeze, in works . . .	,,	7·40	6·66	3s. 4d.	·132	·118
With breeze, in the town. . .	,,	7·40	6·66	5s. 10d.	·231	·208
Gas-Engine—		Cub. Ft.	Cub. Ft	Per 1000 Cub. Ft.		
With town gas .	..	16·487	14·50	2s. 6d.	·490	·435
With gas from outlet of scrubbers	..	18·00	16·00	1s. 6d.	·324	·288
With producer gas, "Simplex" engine	320	Lbs. 1.043	Lbs. ·803	Ton. 15s.	·083	·064
Oil-Engine . . .	3	Pints. 1·352	Pints. 1·019	Gallon. 7d.	1·183	·891

THE FORMATION OF CYANOGEN FROM AMMONIA.

The paper on the above subject, by Dr. E. Bergmann, of which the following is a slightly abbreviated translation, describes researches undertaken at the instigation of Dr. H. Bunte, of Carlsruhe. The paper appeared in recent numbers of the "Journal für Gasbeleuchtung."

Since the time of Scheele and Gay-Lussac, cyanogen has been the subject of many researches; and its scientific and technical importance has made them particularly numerous during the last ten years. Nitrogen is the most important

constituent in regard to the formation of cyanogen; and it is available either free or combined. The formation of cyanogen from free nitrogen is the most curious, since nitrogen is distinguished from other elements by its great inertness. On the large scale, however, cyanogen is formed from free nitrogen in blast-furnaces, as Clark, Zincken and Bromeis, Redtenbacher, and others pointed out many years ago. Lewis Thompson observed, in 1839, that more cyanide was formed when coke or coal was fluxed with potash and iron filings at a red heat if air was admitted, than if the air was excluded; and such formation appeared to be independent of the amount of nitrogen in the carbonaceous matter. Fownes found by experiment that free nitrogen can unite with carbon at a high temperature, provided a substance is present which forms a stable non-volatile cyanide. Erdmann and Marchand, as well as Delbrück, so far confirmed Fownes's experiments that they obtained proof of the formation of cyanogen, though in inconsiderable quantity, by heating to incandescence potassium carbonate with sugar charcoal.

Bunsen and Playfair were the first to fully explain the processes resulting in the production of cyanogen in blast-furnaces. They showed, by experiments on pure materials—namely, sugar charcoal and potash, which yielded no trace of cyanogen in carbonic acid—that the cyanogen compounds formed obtained their nitrogen from the air. They proved also that potassium cyanide was formed when the atmosphere in which the experiments were conducted consisted of nitrogen. They concluded that nitrogen was freely absorbed by the mixture of sugar charcoal and potash, so long as the temperature was maintained at that at which potassium is formed by reduction; but that no absorption occurred at a lower temperature. Rieken independently also came to the conclusion that it was necessary that the temperature of the reduction of potash should be maintained, and that the stream of nitrogen should be heated to a like temperature. Berthelot produced hydrocyanic acid from a mixture of acetylene and nitrogen by the aid of the electric spark; the acetylene having been formed in like manner from carbon and hydrogen. He obtained it also from nitrogen and ethylene or hexylene; but in these cases, there was an intermediate production of acetylene. Berthelot considered that potassium cyanide was produced through a previous formation of potassium carbide (C_2K_2) from the acetylene, and the subsequent absorption of nitrogen by that body. Briegleb and Geuther formed cyanogen from magnesium nitride and carbon. The nitride was formed by heating magnesium filings in nitrogen. Cyanogen could similarly be obtained through the nitrides of other metals.

Oxygen compounds of nitrogen may also yield cyanogen. Kuhlmann found that ethylene, led over heated platinum sponge with excess of nitric oxide, formed ammonium cyanide and carbonic acid. Cyanogen was also formed by passing nitric oxide and alcohol vapour over platinum sponge above 400° C. The formation of cyanogen from nitrogenous organic substances is of more general interest. The fact that such substances, when fluxed with potash, give cyanide, forms the basis of the potassium ferrocyanide manufacture. The spent oxide of gas-works has now established itself as a valuable source of cyanogen compounds; and the old process has been almost given up in Germany. Liebig considered that, by heating nitrogenous constituents with alkali, there was a partial formation of ammonia, which was then converted by incandescent carbon into ammonium or potassium cyanide, and that the non-volatile nitrogen remaining in the coal combined with the alkali and carbon to produce potassium cyanide. This formation of cyanogen is of importance in the analytical detection of nitrogen in organic bodies.

Scheele formed potassium cyanide by heating sal-ammoniac and graphite with potassium carbonate. Clouet found that a substance soluble in water, and with an odour of bitter almonds, was produced on leading ammonia over incandescent carbon. Langlois passed dried ammonia through an incandescent porcelain tube filled with wood charcoal, and obtained as products ammonium cyanide and hydrogen. Kuhlmann produced ammonium cyanide by leading ammonia and carbonic oxide over spongy platinum. He then obtained ammonium cyanide from ammonia and incandescent carbon; and he asserted that methane was formed at the same time. Weltzien did not obtain the latter on repeating the experiments, and his yield of cyanogen was less; but he used a glass tube, and could not therefore employ a sufficiently high temperature. The technical importance of cyanogen has been immensely extended by the use of its compounds in electrotyping and gold extraction. The M'Arthur-Forrest process for extracting gold has caused an extraordinary demand for potassium cyanide.

The present work deals with the formation of cyanogen from ammonia and incandescent charcoal. The papers of Langlois, Kuhlmann, and Weltzien give no detailed accounts of the conditions of their experiments; while their statements are contradictory, and quantitative results are lacking. The researches suggested by Dr. Bunte have in part been carried out by Dr. Bueb; and as his results have not yet been published, they may be briefly given here. His experiments were on the action of ammonia on charcoal at different temperatures—viz., 800°, 1000°, and 1150° to 1180° C. (1472°, 1832°, and 2102° to 2156° Fahr.). The charcoal was heated in a porcelain tube, since iron decomposes cyanogen. At 800° C., only about 4 per cent. of the ammoniacal nitrogen was converted into hydrocyanic acid; but at 1000° C., the percentage had increased to 24, and the rest of the ammonia had almost completely broken up into nitrogen and hydrogen. But if a mixture of coal gas and ammonia, in place of ammonia only, was passed over the incandescent charcoal at a temperature of 1150°—1180° C., 60 per cent. of the ammoniacal nitrogen was converted into hydrocyanic acid, 20 per cent. was decomposed into hydrogen and nitrogen, and 20 per cent. remained unchanged. These results presented sufficient inducement for a more thorough investigation; and the author set himself to ascertain by quantitative researches: (1) What influence coal gas has on the behaviour of ammonia towards incandescent charcoal. (2) What is its behaviour if other gases—such as carbonic oxide, a mixture of nitrogen and carbonic oxide, or of nitrogen and hydrogen—are substituted for the coal gas? (3) What temperatures are most favourable for the formation of cyanogen under these experimental conditions?

There are two possible ways in which the coal gas may behave—either as an indifferent diluent of the ammonia, or by separation of carbon, it may act chemically on the ammonia according to the equation $C_2 + 2NH_3 = 2CNH + 2H_2$. If this action occurs, a greater separation of carbon, which might be effected by the use of carburetted gas, would bring about a greater yield of cyanogen. To solve the question, coal gas and ammonia were passed over incandescent carbon in one set of experiments; and coal gas, carburetted with pentane, and ammonia were passed over it in a second set of experiments. The pentane did not cause an increase in the amount of cyanogen formed.

The experiments on the second question might be expected to show a greater formation of cyanogen when carbonic oxide was applied, from the probability of the following reaction taking place: $CO + NH_3 = CNH + H_2O$. Kuhlmann, indeed, obtained such a double decomposition over spongy platinum; and to ascertain whether it occurred over incandescent charcoal, both carbonic oxide and generator gas mixed with ammonia were passed over the latter, and also, for the sake of comparison, a mixture of nitrogen, hydrogen, and ammonia, free from carbonic oxide. The result was a more or less heavy deposition of carbon in the tube, which pointed to a decomposition of cyanogen. The experiments were repeated at lower temperatures; and finally tests were made on the action of ammonia on carbonic oxide in the absence of the charcoal.

The apparatus employed for the experiments consisted of a gasholder, followed by a meter and a desiccating vessel; an ammonia evolution flask, with potash drying-tube attached; a porcelain tube containing wood charcoal; three U-shaped absorption-tubes; and an aspirating-bottle. The gas was led from the holder through caustic potash, which removed the moisture, into the ammonia evolution flask, whence it passed through the incandescent porcelain tube, packed with pieces of charcoal about the size of peas. The products of the reaction then passed into bulbed U-tubes, charged with solution of potash free from chlorine. In these, the hydrocyanic acid and a great part of the unchanged ammonia were absorbed; the remainder of the latter being taken up by normal sulphuric acid. The unabsorbed gases were collected in the aspirator, and their volume and composition ascertained. The porcelain tube was heated by means of a Fletcher's blast-furnace, which would give a temperature of nearly 1200° C. (2192° Fahr.). Prinseps' alloys of silver, gold, and platinum were used, to determine the actual temperature in particular experiments. The alloys used had the following percentage compositions and melting-points:—

Silver	100	60	40	20	..	..	..	..	..
Gold	..	40	60	80	100	95	90	85	80
Platinum	..	..	..	..	..	5	10	15	20
Melting-point, °C.	954	995	1020	1045	1075	1100	1130	1160	1190

These alloys were compared with the temperatures shown by Wiborgh's air thermometer. For use strips were fused up separately in difficultly fusible glass, in order that they might not be acted upon, and their melting-points consequently affected. Recognition of the different alloys was ensured by giving the glass tubes various shapes—*i.e.*, pointed or round ends, &c. The separation by fusion of the more easily fusible component of the alloy, which is very noticeable at temperatures above 1300°, was not perceptible with the alloys employed in this instance. The amount of ammonia used was ascertained from the loss in weight of the ammonia evolution flask and the following potash tube, which were weighed before and after each test. It could also be ascertained by drawing off from a side arm in the tube leading to the porcelain tube about 3 litres of the ammoniacal gaseous mixture. This was drawn through 10 c.c. of normal sulphuric acid, into an aspirating vessel, until the methyl-orange with which the acid was tinted showed that it was neutralized, when the volume of gas drawn into the aspirator was ascertained and the percentage of ammonia in the mixture was found by calculation.

In making the tests, errors due to the space within the train of vessels being filled with air were avoided by displacing the air in the combustion-tube and the apparatus anterior to it by gas of similar composition to that on which the test was to be made. When the air had thus been displaced, the weighed tubes and aspirator were coupled up to the combustion-tube. The nitrogen of the ammonia was found in three products—viz., (1) Hydro-

cyanic acid, collected as potassium cyanide; (2) ammonia which had escaped change; (3) free nitrogen from decomposition effected at the high temperature.

The hydrocyanic acid was determined by making up the potash solution from the tubes to 500 c.c., and titrating an aliquot part, after neutralization with dilute nitric acid, with decinormal solution of silver. The ammonia was determined by distilling another aliquot part of the potash solution, and receiving the distillate in normal sulphuric acid, which was afterwards titrated back with normal alkali. The ammonia which passed on into the last tube charged with normal sulphuric acid was determined by simply titrating the latter. In the tests made with coal gas, the nitrogen set free was calculated merely by difference, as the variable percentage in coal gas and the relatively small amount of ammonia decomposed, prevented any exact direct method being found. In the tests with carbonic oxide and generator gas, the nitrogen formed by decomposition of ammonia was calculated from the amount of hydrogen produced in like manner. After ascertaining the volume, the gas in the aspirator was analyzed by the Bunte burette, in order to determine the percentage of hydrogen for this purpose. The decomposition of the ammonia may take place according to the equations—

(1) $C + NH_3 = CNH + H_2$; and (2) $2NH_3 = N_2 + 3H_2$

By the first equation, two volumes of hydrogen are set free for every two volumes of hydrocyanic acid; and by the second, three volumes of hydrogen correspond to two volumes of ammonia which have been decomposed, but have not formed cyanogen. The proportions by volume would remain the same, even if carbonic oxide entered into the reaction; thus

(1) $CO + NH_3 = CNH + H_2O$ and $C + H_2O = CO + H_2$
(2) $2NH_3 = N_2 + 3H_2O$

Therefore, taking the total volume of hydrogen found by analysis as $= a$, the hydrogen set free according to equation (1), calculated from the hydrocyanic acid formed as $= b$, the nitrogen $= x$ is found, expressed in grammes, by the equation—

$$x = \frac{a - b}{3} \times 1{\cdot}25$$

[1·25 is the weight of a litre of nitrogen in grammes.]

This equation holds good if the decomposition extends to the already formed hydrocyanic acid; thus:—

(1) $2NH_3 + C_2 = 2CNH + 2H_2$
(2) $2CNH = C_2 + N_2 + H_2$; the value of b being in this case $= 0$.

The experiments may be classed in five groups, as follows: (1) The formation of cyanogen from ammonia, charcoal, and coal gas. (2) The formation of cyanogen from ammonia, charcoal, and carburetted coal gas. (3) The formation of cyanogen from ammonia, charcoal, and carbonic oxide, as well as indifferent gases at 1100° C. and over. (4) The formation of cyanogen from ammonia, charcoal, carbonic oxide, and indifferent gases at temperatures approaching 1000° C. (5) Experiments on ammonia and carbonic oxide without charcoal.

The experiments are described under these five headings.

I.—*Formation of Cyanogen from Ammonia and Charcoal with Coal Gas.*

The action of a mixture of coal gas and ammonia on charcoal was studied under the conditions which earlier experiments had shown to be most favourable to the formation of cyanogen—viz., at a temperature of from 1100°—1180° C. (2012°—2156° Fahr.), and with gas containing about 10 per cent. of its volume of ammonia. Five experiments were made under conditions in which only the rate of flow of the gas through the porcelain tube was varied to a considerable extent. A digest of the results is given in Table I.

TABLE I.—*Formation of Cyanogen from Charcoal and Ammonia with Coal Gas.*

	Duration of the Experiment in Minutes.	Temperature in Degrees Centigrade.	Percentage by Volume of Ammonia in the Gaseous Mixture.	Grammes of Ammonia Passed through the Tube per Hour.	Grammes of Nitrogen used in the Experiment.	Percentage of Nitrogen.		
						Found as Hydrocyanic Acid.	Found as Unchanged Ammonia.	Found as Gas (by difference).
1	33	1100	8·7	6·640	2·734	19·1	69·2	11·7
2	47	1100	9·6	1·860	1·200	22·8	35·4	41·8
3	150	Under 1040	12·0	0·863	1·776	31·0	51·0	18·0
4	180	1100	13·0	0·329	0·815	46·6	21·0	32·4
5	185	1100	14·0	0·269	0·666	52·5	19·0	28·5

The amount of ammonia per hour is highest in the first experiment; and 19 per cent. only of its nitrogen is converted to cyanogen. The amount of ammonia is lowest in the fifth experiment; and 52·5 per cent. of its nitrogen is converted to cyanogen. The cause of this difference must, as the other conditions varied but little, be looked for in the difference in the rate of flow of the gaseous mixture. The lower temperature in the third experiment appears to have been unfavourable to the breaking up of ammonia with liberation of nitrogen. The results of these experiments may be thus summarized: The rate at which ammonia diluted with coal gas is passed over incandescent charcoal has great influence on the formation of cyanogen; and the greater the rate of flow, the more ammonia escapes conversion. In the experiments detailed in Table I., the rate of flow of the gas was about 28 inches per second in No. 1; and the gas was one second passing through the sphere of action. The rate of flow was about 0·8 inch per second in No. 5; and the gas was 50 seconds passing through the sphere of reaction. The formation of cyanogen is greater at 1100° C. (2012° Fahr.) than at 1000° C. (1832° Fahr.). Experiments Nos. 4 and 5 show that ammonium cyanide does not result from passing ammonia over glowing charcoal, since, if it were formed, ammonia at least equivalent to the quantities of hydrocyanic acid would appear. In these instances, the occurrence of ammonium cyanide would have demanded the presence of 47 or 53 per cent. of nitrogen in the form of undecomposed ammonia; and these amounts were not found.

II.—*Formation of Cyanogen from Ammonia and Charcoal with Coal Gas and Pentane.*

The gas was carburetted by passage through a flask containing pentane; and the difference between the weights of the flask before and after the passage of the gas gave the amount of pentane taken up by it. At a sufficiently high temperature, the pentane, like the hydrocarbons of coal gas, may be broken up eventually into carbon and hydrogen; the ultimate decomposition being shown by the equation: $2C_5H_{12} = 5C_2 + 12H_2$. The experiments show that such complete decomposition does not occur at 1100° C. (2012° Fahr.), and that the amount of decomposition varies with the rate of flow of the pentane vapour through the incandescent tube. At 1100° C., a deep brown cloud appeared in the tubes and aspirator when the rate was high; but on moderating the rate of flow, the cloud diminished. Tarry products separated in the tubes and aspirator; and therefore 1100° C. did not suffice for the complete breaking up of the pentane.

Table II. presents a digest of the results of the experiments. The first two were at 1045° C.; and the mixtures contained about the same amount of ammonia. The first, however, contained very much more pentane than the second; and the results of the experiments on the two mixtures are very different—the first giving only 6 per cent. of cyanogen, against 37 per cent. in the second. The quantity of ammonia undecomposed falls in the second case to about half that in the first. These surprising results must evidently be ascribed to the difference in the amount of pentane in the gas. The proportion of pentane to ammonia in the third experiment was five times that in the fourth; but the proportion of cyanogen formed in the third was only 12 per cent., against 33 per cent. in the fourth. The undecomposed ammonia was 80 per cent. in the third, against 49 per cent. in the fourth, notwithstanding the high temperature in both cases. For the same temperature, therefore, the formation of cyanogen increases, and the proportion of undecomposed ammonia diminishes, with a diminution in the proportion of pentane. The explanation of this relation may be found in the great increase in volume of the gas which results from the decomposition of the pentane at the high temperature, and the consequent dilution of the ammonia. This dilution is tantamount to an increase in the rate of flow; and, therefore, according to the experiments on uncarburetted coal gas, should correspond to a smaller yield of cyanogen, and to the escape of more ammonia undecomposed. Carbon had separated freely from the pentane, as a graphitic deposit 1 m.m. (0·039 inch) in thickness was found in the tube. Dicyanogen could not be detected in the products of the reaction.

TABLE II.—*Formation of Cyanogen from Charcoal and Ammonia with Carburetted Coal Gas.*

	Duration of the Experiment in Minutes.	Temperature in Degrees Centigrade.	Litres of Coal Gas Used, at 0° C. and 760 m.m.	Litres of Pentane Vapour added.	Percentage by Volume of Ammonia in the Gaseous Mixture.	Grammes of Ammonia Passed through the Tube per Hour.	Grammes of Nitrogen Used in the Experiment.	Percentage of Nitrogen.		
								Found as Hydrocyanic Acid.	Found as Unchanged Ammonia.	Found as Gas (by difference).
1	120	1045	12·0	4·0	13	0·908	1·690	6·0	61·0	33·0
2	150	1045	8·4	1·2	14	0·504	1·037	37·0	31·0	32·0
3	40	1100	13·7	6·2	20	5·580	3·063	12·5	80·4	7·1
4	45	1100	26·0	1·6	22	7·880	4·860	32·8	49·3	17·9
5	135	1130	6·0	1·8	15	0·432	0·791	30·0	44·0	26·0

Hydrocarbons, therefore, hinder the conversion of the ammonia; and a higher temperature than 1100° C., or longer

exposure to the incandescent carbon, is needed to effect it. The carbon separating from the hydrocarbons, which is in the so-called nascent state, does not increase the activity of the transformation.

III.—*Formation of Cyanogen from Ammonia and Charcoal with Carbonic Oxide, Generator Gas, and Mixtures of Nitrogen and Hydrogen.*

The carbonic oxide for the experiments was made from potassium ferrocyanide and strong sulphuric acid, and had the following average composition: Carbonic oxide, 94·5 per cent.; nitrogen, 4·9 per cent.; and oxygen, 0·6 per cent. This carbonic oxide was used in experiments 1, 3, 4, 5, and 7. In experiments 6 and 8, the gaseous residue from the passage of carbonic oxide and ammonia over the charcoal was used in place of carbonic oxide. It consisted of—

	Experiment 6.	Experiment 8.
Oxygen	0·8 p. ct.	.. p. ct.
Carbonic oxide	67·3 „	28·0 „
Hydrogen	17·6 „	48·0 „
Nitrogen	14·3 „	24·0 „

In the second and ninth experiments, the mixture obtained by the decomposition of ammonia only was used. The chief results of nine experiments are given in Table III.

TABLE III.—*Formation of Cyanogen from Charcoal and Ammonia with Carbonic Oxide, Generator Gas, and Mixtures of Nitrogen and Hydrogen.*

	Duration of Experiment in Minutes.	Temperature in Degrees Centigrade.	Percentage by Volume of Ammonia in the Gaseous Mixture.	Grammes of Ammonia Passed through the Tube per Hour.	Grammes of Nitrogen used in the Experiment.	Percentage of Nitrogen.		
						Found as Cyanogen.	Found as Ammonia.	Found as such.
1	60	1130 Above	46	16·03	13·200	28·1	2·5	63·2
2	60	1020	37	7·90	6·500	33·4	2·1	62·0
3	80	1100	17	4·98	5·470	39·9	7·0	48·2
4	60	1100	17	6·00	5·020	42·0	4·0	62·0
5	50	1130	17	6·90	4·790	39·5	2·6	57·0
6	33	1130	17	12·80	5·300	36·2	4·0	56·0
7	95	1130	10	2·58	3·200	44·2	5·0	51·0
8	45	1100	8	2·04	1·262	56·4	8·0	36·7
9	66	1160	5	2·00	2·340	43·7	10·8	45·5
10	40	950	33	—	10·050	21·2	54·7	24·1
11	130	950 Under	17	—	5·200	28·5	48·0	23·5
12	75	950	11	—	2·960	23·7	42·0	34·3
13	60	1020	7	—	1·600	43·8	31·0	25·2

The main difference in the conditions was the variation of the proportion of ammonia in the gas used; and differences in the results are most evident on a comparison of experiments 1 and 2 with 8. It would appear that the quantity of cyanogen formed increases with the dilution of the ammonia by other gases. The quantities of ammonia undecomposed range from 2 to 11 per cent. in the different experiments, and are therefore much less than those found in the experiments with coal gas and coal gas and pentane. This shows that the theory held by Langlois, Kuhlmann, and St. Cl. Deville, that ammonium cyanide is stable at very high temperature, is untenable. The formation of cyanogen from ammonia in the presence of carbonic oxide, generator gas, &c., depends therefore in general on the same circumstances as its formation with coal gas; but there is a more considerable decomposition of the ammonia and also of hydrocyanic acid. The decomposition was greatest in the first two experiments, where the ammonia was comparatively concentrated; and least in experiment 8, where the gas contained only about 8 per cent. of its volume of ammonia. The extent to which decomposition took place was shown by the volume of gas collected in the aspirator, which was double that of the gas introduced in the first two experiments, and was less in the subsequent ones. The increased volume could only be due to decomposition of ammonia and hydrocyanic acid, as the formation of hydrocarbons and methane could not be proved. The composition of the gas gave no indication of whether the nitrogen and hydrogen were derived from the direct dissociation of ammonia or from hydrocyanic acid formed from it; as in either case three molecules of hydrogen would be found for every two molecules of ammonia. But it was evident that decomposition of hydrocyanic acid had taken place, as a scoty deposit was found on the porcelain boat for the Prinseps' alloy, and also on the charcoal. This was especially noticeable in experiments 1 and 2. No formation of dicyanogen occurred, as its characteristic purple red flame was not produced when the gas passing out of the porcelain tube was ignited. This fact is also supported by the figures in Table III., which gives the principal results of the experiments, as also of those described in Section IV.

IV.—*Formation of Cyanogen from Ammonia and Charcoal with Carbonic Oxide and Nitrogen (Generator Gas) and Indifferent Gases at 950°—1020° C.*

Four experiments were made at lower temperatures than those used in earlier researches; and details of the results are given in Table III. (experiments 10, 11, 12, and 13). The gases used were: In 10, 12, and 13, a mixture of hydrogen and nitrogen; and in 11, generator gas. The quantity of ammonia introduced decreases in the experiments in the order in which they are given. The hydrocyanic acid formed varies from 21 to 44 per cent.; and the unchanged ammonia, from 31 to 55 per cent. The formation of cyanogen is greater the more dilute the ammonia, except in experiment 12, where the temperature was low. Deposits of carbon were not observed as in the experiments at higher temperatures; and there was no extensive decomposition of the hydrocyanic acid formed. Higher temperatures than 1000° C. (1832° Fahr.), therefore, give a greater formation of cyanogen, but at the same time cause greater decomposition of the ammonia and hydrocyanic acid already formed. One important fact became clear from the results in Table III.—namely, that reaction between carbonic oxide and ammonia, resulting in extensive production of cyanogen, did not occur at high temperatures, as had been expected. A comparison of experiments 1 and 2 in Table III. makes this fact clear.

V.—*Experiments with Ammonia and Carbonic Oxide without Intervention of Charcoal.*

These experiments were undertaken to ascertain whether at high temperatures carbonic oxide acted on ammonia and produced cyanogen, when the charcoal in the tube was replaced by pieces of porcelain. The gas used was generator gas, containing, in experiment 1, 27·3 per cent., and in experiment 2, 12·7 per cent., of carbonic oxide. A temperature of about 1100° C. was used; and each of the experiments lasted one hour. There was 18 per cent. in the first, and 30 per cent. in the second, of ammonia in the gas by volume; and therefore 5·17 grammes, and 12·75 grammes of ammonia passed through the tube in an hour. Of the nitrogen admitted, 0·6 and 0·4 per cent. became cyanogen, 32·5 and 62·2 per cent. remained as ammonia, and 68·0 and 34·0 per cent. was free. The formation of cyanogen, therefore, does take place, though to a very limited extent. No soot was found deposited on the porcelain, showing that no breaking up of cyanogen had occurred.

The results of the work described above may be summarized thus:

1.—By leading ammonia over glowing charcoal, hydrocyanic acid, and not ammonium cyanide, is formed. Nitrogen and hydrogen also occur; but methane never does.

2.—Dilution of the ammonia with coal gas effects an increase in the cyanogen formed, and also a decrease in the amount of ammonia broken up to nitrogen and hydrogen.

3.—The introduction of high molecular hydrocarbons, in contrast to 2, diminishes the yield of cyanogen in consequence of the protection to the ammonia afforded by the splitting up of the hydrocarbons at high temperatures. Nascent carbon, therefore, is not active.

4.—The rate at which ammonia diluted with coal gas is led over charcoal, has much influence on the conversion. The greater the speed, the less cyanogen is formed, and the more ammonia passes on unchanged.

5.—If carbonic oxide is used in place of coal gas for diluting the ammonia, cyanogen is formed to about the same extent; but there is a greater decomposition into nitrogen and hydrogen. The same occurs if generator gas or a mixture of nitrogen and hydrogen takes the place of the carbonic oxide.

6.—The greater yield of cyanogen obtained when the ammonia is diluted with other gases is not due to a chemical interaction of the gases and ammonia, but solely to the diluted ammonia being better able to resist resolution into hydrogen and nitrogen than undiluted. The greater the proportion of ammonia in the gaseous mixture, the greater is the amount which is thus resolved.

7.—The most favourable temperature for formation of cyanogen varies according to the nature of the diluent. With carbonic oxide, generator gas, and mixtures of nitrogen and hydrogen, it lies between 1000° C. and 1100° C. With mixtures containing hydrocarbons, the lower limit at least approaches 1100° C. The more hydrocarbons, and the higher the number of atoms in their molecules, the more ammonia escapes decomposition at this temperature.

Manchester District Institution of Gas Engineers.—The quarterly meeting of this Institution will be held next Saturday, when, as usual at this season, the day will be devoted mainly to pleasure. According to the programme issued by the Hon. Secretary (Mr. S. S. Mellor, of Northwich), the members will be conveyed from Manchester and Huddersfield by train to Worksop. Conveyances will be in readiness to take them to the Lion Hotel, where, after luncheon, the few business items will be disposed of under the presidency of Mr. Isaac Carr, of Widnes. These include the election of four new members. The party will then start for Welbeck Abbey, where an inspection will be made of the underground rooms and picture gallery. Thence the party will drive to Edwinstowe, where a visit may be made to the "Major Oak." The return to Worksop will be through Thoresby and Clumber Parks. Tea will be served on arrival; and early trains will leave for Manchester and Huddersfield. Everybody who has been through the "Dukeries" testifies to the charm of the drive; and, favoured with a fine day, this excursion should be one of the most delightful the members of the Institution have had.

REGISTER OF PATENTS.

Gas-Meters.—Fiddes, W., of Bristol, and W. & B. Cowan, Limited, of Westminster. No. 7358; April 10, 1895.

The object of this invention is to provide, in combination with gas-meters, means whereby arrangements through which the consumption of gas is indicated are automatically adjusted in accordance with the temperature; so that the quantity of gas registered by the meter shall be the volume which the gas occupies at a given temperature—say, 60° Fahr. In meters as hitherto arranged, as the gas expands or contracts in bulk (owing to changes in temperature at the place where the meters are situated), the registration of the meter does not really indicate the standard volume of gas at a given temperature which has passed through the meter.

According to this invention, the effect of temperature in altering the bulk or form of gases, liquids, or solids is employed, so that, as the temperature varies, the amount of gas which the meter passes at each operation is automatically varied—the meter passing a less volume at low temperatures, and a larger volume at high temperatures.

It may be practically applied in various ways: For example, in a dry gas-meter there may be mechanism by which the movements of the bellows are conveyed to the registering device or counter, with a connection or attachment of the part which is caused to vary in bulk or form under variations of temperature, which will vary the amount of movement of the parts which measure the volume of gas passing. In a wet meter (such as a station meter, where liquid is constantly supplied to the meter), the part which is caused to vary in bulk or form under variations of temperature may operate a device which will lower the level of liquid, and cause it to rise, according to the variations of temperature.

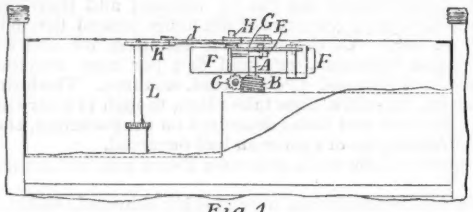
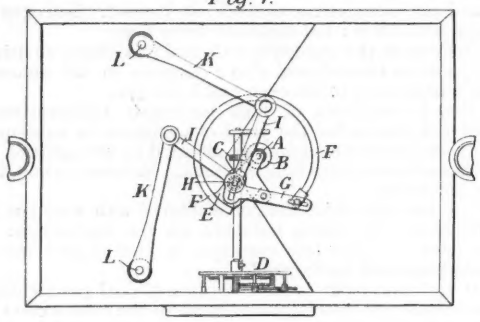


Fig. 1.



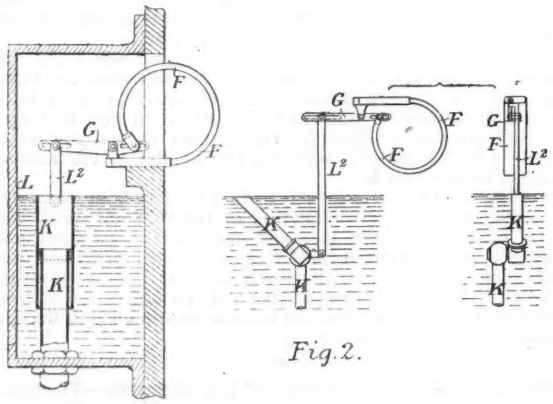


Fig. 2.

Fig. 1 shows in sectional elevation and plan the upper portion of a dry gas-meter, provided with an arrangement according to this invention. Fig. 2 shows two arrangements of a station wet meter.

Referring to fig. 1, A is the cranked shaft or spindle, which receives rotary motion by the pulsations of the bellows of the meter. This crank operates the valves, and also (through the worm B and worm-wheel C) the counter D, in the usual manner. Fast on the spindle is an arm E, to which is rigidly connected one end of a curved rod or tube F, of any material which will readily expand and contract by variations of temperature. It is preferably hollow, for containing a fluid under pressure introduced by making a hole in it communicating with the interior, and being traversed by a second hole into which a filling (for example, of lead) is placed, and through which is a continuation of the first hole. After the air has been exhausted through the first hole, and fluid has been allowed to enter thereby, and been brought, by a pump or forcing device, to the pressure requisite to sufficiently distort the tube, the filling in the second hole is compressed to close the first hole, and the pump used for introducing the fluid is removed. The end of the curved rod is attached, by a pin-and-slot connection, to one end of a lever G, which is centered to the arm E; the opposite end of the lever being provided with a curved slot, in which is fitted to slide a stud H. To the stud are connected (by the links I) the arms K fast on rods L, which are caused by the pulsations of the bellows to rock in their bearings, and impart through the arms and links already described rotation to the shaft or spindle A. The volume of gas admitted to the interior of the bellows to effect its pulsations will depend upon the position of the stud H in the curved slot. The farther the stud is moved in the slot from the spindle A, the greater will be the extent of expansion and contraction of the bellows. It consequently will need a greater volume of gas to effect the rotation of the shaft A; while the nearer the stud is moved towards the shaft or spindle, the less will be the expansion and contraction of the bellows. Consequently, a less volume of gas will pass at each rotation of the shaft. The position of the stud H is automatically adjusted nearer to, or farther from, A by the contraction and expansion of F. Consequently, when the temperature is below a certain medium, and the gas is below a certain density, the rod F will be contracted, and will move the stud nearer to the shaft, and thereby restrict the movement of the bellows so as to admit a less volume of gas at each rotation of the counter mechanism. When, however, the temperature is above the medium, and the gas is correspondingly dilated, the rod F will expand and move the stud farther from the shaft. This will permit of the expansion and contraction of the bellows to a greater extent, and so admit of an increased volume of gas passing for each rotation of the counter mechanism. Consequently, whatever the temperature may be, the gas passing through the meter will at all times register on the counter a uniform supply at a certain medium density.

In applying the invention to wet gas-meters—such as are used as station meters—as shown in fig. 2, the expanding and contracting rod F carries at one end the fulcrum of a lever G, one arm of which is joined, by a pin-and-slot connection, to the other end of F. The other arm of the lever is similarly connected, by a link L^2, to the sliding portion of the outlet-tube K for water. This tube is made telescopic in the chamber L, to which water is constantly supplied; the level of the liquid being determined by the height of the telescopic tube, through which any excess of liquid admitted to the chamber will overflow. The chamber L is in communication with the chamber containing the drum or gas-measuring device; and to prevent the escape of gas by the tube K, it is provided with a syphon bend, so as to form a seal. The level of the liquid in the chamber L, and in the chamber containing the measuring drum, determines the volume of gas allowed to pass through the meter; and the level of the liquid is automatically regulated by variations in the temperature due to the action of temperature as aforesaid on the rod or tube F. When the temperature increases above a certain medium, and the gas is consequently dilated, the rod or tube F expands. This turns the lever G on its fulcrum, so as to lower the sliding portion of the telescopic tube K to below the normal level of the liquid, and cause the liquid to overflow through the tube, and increase the space in the measuring chamber of the meter, so as to allow a greater volume of gas to pass. In like manner, when the temperature decreases below the normal, the rod or tube F contracts. This acts on the lever G to raise the moveable part of the tube K, so that the liquid which flows into the chamber will be raised above the normal level, and so decrease the space in the measuring chamber for the passage of gas.

Instead of the telescopic overflow-tube last described, a hinged or articulated overflow-pipe may be employed, as shown at the right hand of the engraving, fig. 2. This will be clearly understood without further description.

Gas-Stoves.—Morton, R., of Hamilton Terrace, N.W., and Pringle, R., of Blackheath, S.E. No. 11,430; June 11, 1895.

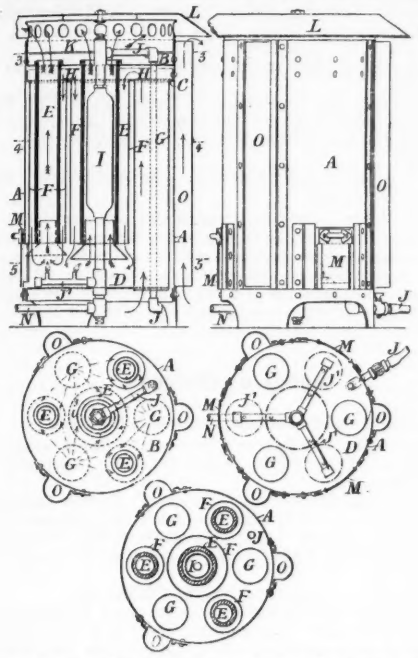
This is an invention whereby it is claimed that "absolutely complete combustion of the constituents of coal gas is obtained by the use of ordinary (or non-atmospheric) burners, producing clear bright luminiferous flames, which do not impinge upon any part of the stove; it being only to the currents of heated air generated by the combustion that the metallic surfaces of the stove are exposed."

This is attained by so proportioning the gas and air supplies that the process of combustion shall be thoroughly completed in the flame, and by utilizing part of the heat of combustion to gradually raise to the necessary temperature both the gas to be consumed and the air admitted to support combustion, before the gas and air meet at the point of ignition. They are thus, so to speak, prepared for complete oxidation. There is therefore "no reduction of the heat of the flames either by contact with cooling surfaces or by the inrush of either cool air or gas; and the conditions are such as to be eminently calculated to ensure perfectly complete combustion of the constituents of the gas, and avoid the highly deleterious effects produced by the combustion of gas in ordinary non-atmospheric burners."

The engraving illustrates a stove of circular form, having tubes symmetrically disposed around a central burner. There is a vertical sectional elevation of the stove, an external elevation, and horizontal sections respectively taken on the lines 3, 4, and 5.

A is the casing of the stove, in which are fixed horizontal diaphragms or tube-plates B C D. Vertical flue-tubes E (of fire-clay, and open at both ends) are suspended by their upper ends in apertures in the top tube-plate B; the lower end of each tube terminating above the level of the burners. These tubes are preferably equally spaced around a central similar tube, and form, with the central tube, upcast flues to receive the ascending current of hot air and products of combustion. Below B is another tube-plate C, apertured to carry the tubes F, which give passage to the flue-tubes E, and form downcast flues for the admission of the inflowing heated current of fresh air. The bottom of the stove casing is closed by the lowermost diaphragm D, below the level of the burners, so that no direct access of cold air to them is possible. Vertical tubes G, arranged alternately with the tubes already described, are fixed in apertures in the tube-plate C, and in corresponding openings in the bottom plate D, which is raised by the feet of the stove a sufficient distance above the ground to permit fresh air to pass up through the tubes G to the chamber H, enclosed between the plates B and C; the temperature of the inflowing fresh air being raised in ascending through the tubes G in the upper chamber H, and by contact with the highly heated flues E.

In one of the flues E—preferably the central one of the series—is placed a gas-heating chamber I, forming an enlargement of the gas-supply pipe J, which descends vertically through this flue. The burners are placed on radial branches J^1, just above the bottom diaphragm D of the stove casing. The gas-supply pipe enters the stove casing either at the top or bottom, but preferably at the bottom, as shown, in which case the pipe is preferably first led upwards through



the bottom plate D, within the casing, between the tubes, and through and over the top tube-plate B, to the central flue E, in which it is connected to the heating chamber I as described. One set of burners is placed centrally beneath one of the flue-tubes E, while the other series is preferably placed, not immediately below the central flue E, in which the gas-heating vessel I is placed, but beneath a sheet-metal funnel-shaped deflector projecting downwards from the central flue E. Thus, not only can the flames not impinge directly on the gas-pipe and heating vessel, but they are at such a distance therefrom that the heat of the ascending current through the central flue is moderated, so that while the gas is sufficiently heated to avoid cooling the flame and ensure perfect combustion under the conditions described, overheating of the gas (which would have the effect of causing a deposit of carbon in the heating vessel, and the impoverishment of the gas to the detriment of the heating power of the flames) is practically avoided, although provision is made by plugs at top and bottom for cleaning out the heating vessel in case of accidental deposit therein.

The other flues E may also have similar downwardly projecting funnel-shaped prolongations (as indicated in dotted lines); and the burners may be of the smallest size used for lighting purposes—the size of the burners beneath the flues E depending on the size of the stove and the amount of air supplied for combustion. For a consumption of 20 cubic feet of gas per hour, the air-inlet tubes G should have an aggregate area of approximately 50 square inches, and a height of about 18 inches; but after the stove has been thoroughly heated, the gas supply may be so diminished as to lower the flames below the normal capacity of the burners.

The top K fits removably in the sides of the stove casing, and is a short distance above the top tube-plate B; the products of combustion being discharged through side openings in the flange of the cover. In order that the discharge may be directed downwards when required, a deflecting-plate L (reversible or removable at will) is placed upon the cover; its inclined marginal portion projecting some distance beyond the sides of the stove casing, so as to direct downwards the current escaping through the openings. There are close-fitting doors M on the sides of the stove casing, over apertures opposite to the burners, so as to give access to the latter for lighting or renewal. For lighting purposes, these doors are apertured and fitted with transparent material. External gills, in the form of vertical channels O, open at top and bottom, may be attached to the outside of the casing, in order to ensure more thorough circulation of the atmosphere in the immediate neighbourhood of the stove. These channels are preferably of U-section, with lateral flanges either fitting in grooves provided on the casing (so as to be removable at will) or permanently fixed.

Gas-Heated Ovens.—Richmond, E. W. T., of Warrington. No. 11,443; June 12, 1895.

According to this invention, the oven-burners are loosely mounted; and in some cases, they are arranged one on either side. They are supported at one end, by resting in a socket, or other suitable support; while at the other end, they are carried by the pipe which supplies the gas to them, by devices which slip over the pipe, or by similar provision. Upon the side nearest the burners, the burner-ends rest; while the other side (in the case of the pipe being round) is held by bearing upon a part of the oven wall. The gas-pipe itself passes through the side walls of the oven. The nipples which supply the gas from the pipe to the atmospheric burners, direct the gas horizontally into a tube lying parallel with the tube in which the burner nozzles or holes are provided; and it may be formed thereon at the back of the tube—the entrance to the tube being constructed to admit the necessary air.

Preventing the Lighting-Back of Bunsen Burners.—Hall, C. F. N., of Smethwick, and James, T. W., of Moseley. No. 15,617; Aug. 20, 1895.

To prevent the lighting-back of bunsen burners in gas-stoves and the like, the patentees propose to provide them with a cover or lid which automatically closes the aperture ordinarily provided for the inlet of the air, by the action of turning off the gas at the tap, and which will also open or uncover the aperture immediately the gas is turned on again. Therefore, as soon as the gas is turned off, the air-inlet is closed, so as to prevent any mixture of gas and air taking place inside the tube while the burner is not in use. Upon lighting the burner again, there being no mixture of gas and air left in the tube, it is impossible for the gas to light back or explode and ignite in the air chamber. The movement of the cover to open or close the air-inlet, simultaneously with the movement of the tap or valve in the turning on or off of the gas, is effected by a lever or other suitable means.

Gas Igniting and Extinguishing Apparatus.—Czarnikow, A., of Berlin. No. 2915; Feb. 8, 1896.

This invention relates to an electric gas-igniter with two separate current-circuits, in which by closing one current-circuit the armature of an electro-magnet is attracted, which, by opening a contact, causes sparking, and simultaneously releases the armature (hitherto held fast by a projection) of an electro-magnet interpolated in the second current circuit. In consequence of this, the valve held closed by the armature automatically opens under the pressure of a spring; while the extinguishing of the flame is effected upon the closing of the second current-circuit by the armature pressing the valve again upon its seat.

Double-Acting Gas-Engine.—Bromhead, S. S.; a communication from A. Niel, of Evreux, France. No. 4153; Feb. 24, 1896.

This invention refers to a gas-engine which is said to "work equally well with ordinary lighting gas, or with gas deficient in carbon, or with any mixture of air and carburetted hydrogen."

The explosion cylinder is closed at each end, similarly to the cylinders of steam-engines; and the piston receives alternately at every two revolutions, an explosion at each of its two faces. The admission of the explosive mixture occurs only at one end of the cylinder, and lasts during the whole stroke of the piston. But, on the return of the piston, the two ends of the cylinder being put in communication, part of the mixture is driven back from one end of the cylinder and drawn into the other end. When the mixture is thus divided into two nearly equal parts, the communication is interrupted. Then the piston, continuing its course, compresses the first portion of the mixture as far as the dead-point where the ignition occurs. The piston then driven by the explosion performs its work, by the heated gas being expanded to double its original volume. At the fourth motion of the piston, the gases are expelled.

During the third motion, and while the expansion of the first portion is taking place, the second portion is similarly compressed, and then ignited at the dead-point. After this, it expands, and is finally expelled as before stated.

The regulating control is obtained by the action of a governor, either by modifying the richness of the explosive mixture or by suppressing the flow of gas altogether.

Incandescent Gas-Mantle Shield.—Anderson, J.; a communication from W. Anderson, of Hanover. No. 4421; Feb. 27, 1896.

In order to prevent, as far as possible, injury to the lower edges of incandescent gas-mantles and disintegration caused by the shaking which results from the passage of air-currents to the flame, the patentee proposes to provide an annular shield stamped from thin sheet metal, and suspended by an inner turned-in lip on the edge of the burner. The mantle is supported in the usual way, at such a level that its lower edge extends into the trough-like hollow of the shield, where it is sheltered from the air-currents.

APPLICATIONS FOR LETTERS PATENT.

8793.—Thompson, W. P., "Gas-cooker." A communication from G. Horn. April 27.

8807.—Köhler, A., "Gas lighting by means of carburating elements." April 27.

8812.—Frost, H. G., "Gas lighting or fittings." April 27.

8813.—Bickerton, H. N., "Gas and oil engines." April 27.

8861.—Imray, O., "Generating, purifying, and liquefying acetylene." A communication from E. Rousseau. April 27.

8870.—Raphael, M., "Chimney for gas incandescent light." April 27.

8935.—Smith, W. B., "Mantles, filaments, rods, and cylinders heated by gas." April 28.

8942.—Smith, R. A., "Propelling apparatus for air, gases, or fluids." April 28.

9037.—Browne, J., and Rice, J., "Quenching and conveying coke from gas-retorts, and coke and ashes from other furnaces." April 29.

9056.—Loewenberg, G., "Automatic gas-lighting devices." April 29.

9147.—Falk, S., "Incandescent gas-burners." April 30.

9182.—Fletcher, T., Russell, W., and Messrs. Fletcher, Russell, and Co., Limited, "Gas heating apparatus." May 1.

9199.—M'Ghee, G., "Gas or internal combustion motor engines." May 1.

9216.—Simmance, J. F., "Coin-freed meter apparatus." May 1.

9233.—Willey, H. A., and Simpson, S., "Prepayment mechanism for gas, electricity, and other meters." May 1.

9244.—Nicholls, W., "Incandescence bodies for illuminating purposes." May 1.

9305.—Sharp, J., "Gas-lamps, specially suitable for railway carriages." May 2.

9315.—King, C., "Gas and other taps or cocks for preventing leakage." May 2.

9316.—Botley, C. E., and Botley, C. F., jun., "Treatment of gas for illuminating and other purposes." May 2.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

An Acetylene Gas Explosion.

SIR,—In your last issue, Mr. Infante describes the conditions under which a spontaneous explosion of acetylene took place, and asks for an explanation of the occurrence.

The key to the mystery is found in his statement that the carbide scattered on the table emitted a gas which ignited spontaneously.

Some of the samples of Continental carbide contain considerable quantities of phosphide of calcium, owing to the use of phosphatic lime in its manufacture; and this evolves phosphuretted hydrogen on contact with water—this gas spontaneously igniting on contact with air, and in turn firing the acetylene.

The perforated pot to hold the calcic carbide is so arranged in Mr. Infante's apparatus, that the first portions of gas evolved are mixed with a considerable volume of air present in the holder. This at any time would be an extremely dangerous device; and your correspondent is to be congratulated on having escaped without personal injury.

The present manufacture of acetylene from impure carbide, and the sale and use of automatic acetylene generators utterly unfitted for the purpose for which they are intended, is fraught with very grave danger; and I fear that in the next few months you will have to record many such accidents. This is the more to be deplored, as the undue haste to employ this most beautiful illuminant will only result in unjustly discrediting it.

VIVIAN B. LEWES.

May 6, 1896.

The Recent Accident to a Gasholder at Gothenburg.

SIR,—I think any engineer reading Mr. Niven's letter in the "JOURNAL" for March 10, would infer that he (Mr. Niven) did not pretend to any great experience in gasholder construction, or he would be able to judge for himself as to the stability of such a small holder as the one in Calcutta without asking the questions he did in the "JOURNAL."

If Mr. Niven will refer to the "JOURNAL" for March 24, he will find that his somewhat irrelevant questions were fully replied to by Mr. Samzelius. No one but Mr. Niven would imagine from the correspondence which has followed his letter, that I "ungraciously prevented him from knowing more about the destroyed holder." Indeed, it is the reverse. Moreover, I took the trouble to write to him privately, and gave him the most modern English practice with regard to the questions he asked, so that he might satisfy himself as to the safety of the Calcutta gasholder.

With regard to the concluding suggestion in Mr. Niven's letter, for which gas engineers and gasholder makers will doubtless be grateful, he has evidently made an important omission. Surely his own name is needed in the "copartnery" to make the book worth the buying. Otherwise, what guarantee have we that it will not be deficient in "logic" and purity of style?

F. S. CRIPPS.

27, Great George Street, S.W., May 6, 1896.

Sulphate of Ammonia v. Nitrate of Soda.

SIR,—In view of the present abnormal difference between the market prices of these two articles, we venture to make the following remarks, with the object of eliciting communications from other readers.

All consumers of these articles are aware that their value as manures depends upon the percentage of the nitrogen existing in each; and we believe it will be generally admitted that a unit of nitrogen in the one is as efficacious as a unit of nitrogen in the other. It seems, therefore, extraordinary and unaccountable that sulphate of ammonia containing 20 to 21 units of nitrogen, should be selling at £8 per ton, when nitrate of soda containing only 15 to 16 units of nitrogen fetches practically the same price. If the value of the unit of nitrogen be the same for each article, it follows that, instead of sulphate of ammonia only fetching £8 per ton, as at present, its price should be £10 13s. 4d. per ton. On the other hand, if sulphate of ammonia be actually only worth £8 per ton, then nitrate of soda, on the same basis, should be saleable at not over £6 per ton—instead of £8 per ton as at present.

In spite of a lengthened experience in both articles, we must confess ourselves unable to account for the discrepancy between their present sale values and their relative intrinsic values; and we shall be pleased if, by your insertion of these lines, some light be thrown upon the present anomalous position.

DUNN BROTHERS.

Manchester, May 6, 1896.

Exhibitions of Gas Appliances.—Last week a joint exhibition of their domestic gas appliances was held at Stockton by Messrs. R. and A. Main and Messrs. John Wright and Co. Miss Parker, of the Nottingham School of Cookery, delivered a series of lectures. A small charge was made for reserved seats; and the proceeds are to be handed to the Stockton and Thornaby Hospital. The gas exhibition held under the auspices of the Truro Gas Company some twelve months ago, proved very successful; and as a result the Company have since fixed about 120 cookers. They have arranged with Messrs. J. Wright and Co. to hold another exhibition from the 18th to the 22nd inst., with Miss Thwaites as lecturer. Under the direction of the Corporation Gas Committee, an exhibition was held at Retford last week. In opening it on Tuesday, the Mayor (Mr. Beardsall) pointed out that, by using more gas, the consumers were not contributing to swell the dividends of shareholders, as the undertaking was the property of the ratepayers generally. Last week, Messrs. W. Parkinson and Co. held exhibitions at Malvern Link and West Malvern; Miss Edith Sanderson giving demonstrations on cookery twice daily at both places. Messrs. Fletcher, Russell, and Co., Limited, held an exhibition of their appliances for cooking and heating in Broughty Ferry last week, at which Mrs. H. M. Young, of Chester, was the lecturer.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress was made with Bills last week:—

Bills read the first time, and referred to the Examiners: Bonnybridge, &c., Water Provisional Order Bill, Huddersfield Water Bill, Lanarkshire (Middle Ward District) Water Bill, Matlock Bath Gas Bill, South Metropolitan Gas Bill.

Bill read a second time and committed: Colwyn Bay and District Gas Bill.

Bills reported, with amendments: Fylde Water Bill, Guildford Gas Bill, Ilfracombe Gas Bill, Manchester Corporation Bill.

Bills read the third time and passed: Fylde Water Bill, Guildford Gas Bill.

Opposition withdrawn: Aldershot Gas and Water Bill, East Surrey Water Bill.

The Culter Water Order Confirmation Bill was introduced by Lord Balfour, and (a Sessional Order applicable thereto having been dispensed with) read the first time, and referred to the Examiners.

Petitions were presented against the Lanarkshire (Middle Ward District) Water Bill, from the District Committee of the Upper Ward of the County of Lanark; and against the Matlock Bath Gas Bill, from the Matlock Bath Gas Company.

HOUSE OF COMMONS.

The following progress was made with Bills last week:—

Bills read the first time, and referred to the Examiners: Gas Provisional Orders Bill, Gas and Water Provisional Orders Bills (Nos. 1 and 2).

Bills read a second time and committed: British Gaslight Company (Norwich) Bill, Malvern Link Bill, Padiham Urban District Council Water (Extension of Time) Bill, Yeovil Corporation Water Bill, Ystradyfodwg Urban District Council Gas and Water Bill.

Bill reported: Bournemouth Gas and Water Bill.

Bills reported, with amendments: Barnsley Corporation Water Bill, Birmingham Corporation Water Bill, Bonnybridge, &c., Water Provisional Order Bill, Cowes Gas Bill, Leamington Corporation Bill, London Sea Water Supply Bill, Sheffield Corporation Water Bill.

Bills read the third time and passed: Bonnybridge, &c., Water Provisional Order Bill, South Metropolitan Gas Bill.

A Bill, to confirm certain Provisional Orders of the Local Government Board, under the Gas and Water Works Facilities Act, 1870, and the Public Health Act, 1875, relating to Great Driffield, Sandwich, South Molton, and Tiverton, was brought in, read the first time, and referred to the Examiners.

A Bill, to consolidate and amend the law relating to the liability of employers for injuries to their workmen, was brought in by Mr. John Burns and other members, read the first time, and ordered for second reading.

A Select Committee, consisting of Sir Michael Hicks-Beach, Sir H. Campbell-Bannerman, Sir W. Hart-Dyke, Sir R. Reid, the Solicitor-General, Mr. Bonsor, Mr. Courtney, Mr. Haldane, Mr. Halsey, Mr. Grant-Lawson, Mr. Lloyd-George, Mr. M'Neil, and Mr. Wodehouse, was appointed to "inquire and report whether it is desirable to define more precisely the nature and extent of personal pecuniary interest in any question before the House which should disable a member of the House from voting upon such question; and what procedure can most advantageously be adopted for enforcing such disability."

HOUSE OF COMMONS COMMITTEE.

Tuesday, May 5.

(*Before Mr.* SEALE-HAYNE, *Chairman; Colonel* LONG, *Mr.* MILDMAY, *and Mr.* M'EWAN.)

BOURNEMOUTH GAS AND WATER BILL.

This Bill, by which the Bournemouth Gas and Water Company seek power to alter their limits of supply, construct new works, apply for a Provisional Order or Licence for the supply of electricity, raise additional capital, &c., came before the above-named Committee to-day.

Mr. POPE, Q.C., Mr. LITTLER, Q.C., Mr. CLAUDE BAGGALLAY, and Mr. BAUMANN appeared for the promoters; Mr. SHIRESS WILL, for the Pokesdown Urban District Council, who were petitioners against the Bill; and Mr. RICKARDS represented Mr. F. G. CASE, a private property owner.

Mr. BAGGALLAY, in opening the case, gave a brief history of the Company. He said that in 1864—little more than thirty years ago—the old Bournemouth Gas and Water Company were incorporated, under the Limited Liability Acts, with an original nominal capital of £50,000; and the limits of supply prescribed by the Articles of Association were "the town of Bournemouth and the vicinity thereof, either in the county of Hampshire or the county of Dorset." At that time, Bournemouth was a very small place; and the Company originally intended to supply gas only. But, at the request of the Local Authority of that date, they undertook to supply water as well. The Company were very rapidly successful; and by 1873, or within nine years, they had issued the whole of the capital they originally intended raising; and £37,000 of it was paid up. In that year, the Company, at the request of the Local Authority, moved their original gas-works to a place about two miles from the town; and placed them on a site about 86 feet above it. In doing this, of course, they had to lay a very considerable extent of main, which at that time was unremunerative. In 1873, the Company

applied to Parliament, to be incorporated, and placed under the Gas-Works Clauses Acts of 1847 and 1871; and they then became a statutory Company, with restrictions as to illuminating power, price, accounts, and so forth. By the Bournemouth Gas and Water Act, 1873, the capital was fixed at £100,000, of which £50,000 was additional; and borrowing powers were conferred upon them to the extent of £25,000—the usual proportion of one-fourth of the share capital. By the Act, the Company's limits were prescribed. The prices to be charged for gas were to be 6s. 6d. per 1000 cubic feet inside the borough of Bournemouth, and 7s. 6d. in such parts of the limits as were beyond the actual borough boundary. By section 54 of the Act, rates were fixed for the supply of water. He would not go into the details of what the water charges were, because he should have to do that later on. All he would say was that the Company had not been charging anything like the prices authorized; and they proposed, under the present Bill, to reduce still more their powers in this respect. The Company were very successful; and in 1877, owing to the rapid growth of Bournemouth, and the large consumption of gas and water, the capital powers, both share and loan, were exhausted. In 1878, the Company went to Parliament for another Act; and they obtained it. This was the last Act they obtained; so that they were at the present time under the two Acts of 1873 and 1878. By the Act of 1878, further capital to the extent of £150,000 was authorized, with borrowing powers to the extent of £37,500. There was a restriction placed on the issue of the authorized capital—namely, that the rate of interest should not exceed 5 per cent.; and if any of the capital already issued as loan capital should be re-issued, it was also to be at a rate of interest not exceeding 5 per cent. In the Act of 1878, various alterations were made with regard to the supply of gas; and, in particular, as to the price. Inside what was now the borough of Bournemouth, and what was then the district of the Town Commissioners, in three years the price was not to exceed 5s. 6d. per 1000 cubic feet; then for a further period of five years, it was not to exceed 5s.; and after that, 4s. 6d. But, as a matter of fact, the Company were so anxious to develop their business—and they were in a position to do it—that within four years they had already reduced the charge for gas to 4s. 6d., although the Act had given them eight years within which to make the reduction. In the district beyond the borough, the price was to be for three years 7s., and after that 6s. per 1000 cubic feet. At the beginning of 1885, the Company, though they were not required to do so, voluntarily reduced the price from 4s. 6d. to 4s. 3d. In 1886, they lowered it to 4s.; in 1887, to 3s. 10d.; and in 1888, to 3s. 6d. This was the course within the borough. At the same time, the increase in the make of gas was most extraordinary. Comparing the two years 1880 and 1890, he found that in the former year the make was 47¼ million cubic feet; whereas in the latter it was upwards of 172½ millions—being nearly four times as much as in 1880. To go back for a moment to a point which he had forgotten, he would mention that the Company, although authorized to charge a higher rate for their gas outside the borough, as a matter of fact charged the same price throughout their entire district. Coming down to quite a recent date, on Dec. 31 last the Company stood thus in regard to their capital: They had called up £225,000 of share capital, leaving £25,000; and they had raised £56,250 of loan capital, leaving £6250. Therefore their total share and loan capital was now £281,250 raised, and £31,250 authorized but not raised. These figures, he understood, were the same now as they were on the 31st of December last. In regard to water, there had been a corresponding development. The original works of the Company were in the Bourne Valley, 1½ miles north-west of what was formerly the town of Bournemouth. The Company erected pumping plant there—and he might mention that this was entirely a pumped water supply, as there was no watershed from which it was collected and impounded—and they constructed a reservoir capable of holding 200,000 gallons. The water came from the Bourne Brook, and was of excellent quality. Subsequently the works were added to, and a pumping-station erected at Longham, on the River Stour, farther to the north. At the same time a service reservoir was made at Alderney Manor. He thought these were practically all the existing works of the Company, except the Tuckton works on the east side of the town. To show what the increase had been in the consumption of water, he would give a few figures, as he had done in the case of gas. In 1885, there were 212 million gallons of water supplied; in 1895, 445 million gallons, which was a doubling at the rate of once in 7½ years. As to the water-rates, under the Act of 1873 there was an authorized charge, which was to be calculated on the gross estimated rental of the houses supplied. If the rental was above £12 and under £20, the rate was not to exceed 5 per cent.; if above £20, it was not to be more than 5½ per cent.; and if below £12, it was not to exceed 2d. per week. These were the charges. But, as a matter of fact, the Company were, and, he believed, for a long time had been, charging on the net rateable value according to the valuation list, and not on the gross estimated rental at all. Then there were certain charges drafted with respect to water supplies by meter; and, if necessary, the promoters would be able to give the Committee evidence of what these prices were. The maximum authorized charge for a meter supply was 2s. 6d. per 1000 gallons; and this they proposed to reduce by the Bill. As a matter of fact, they had never charged that figure, or anything like it. For the first 50,000 gallons, the charge was 2s. 3d. per 1000 gallons; but for a larger quantity it fell as low as 1s. 6d. For public purposes, there was a provision for the supply of water to the Commissioners of Bournemouth at a rate not to exceed 1s. 6d. per 1000 gallons. But the charge hitherto had been considerably less; and the Company proposed to reduce that again. They gave a free supply in case of fires. As to the growth of the place, the town began fifty years ago. In 1856, a body of Improvement Commissioners was established; and in 1890 the borough was incorporated. In twenty years the population had increased 5½ times. In 1881, it was 16,858—three times what it had been ten years previously; and in 1891, it was 37,781. During the past five years, there had been a further large increase. He pointed out that, under the Act of 1873, the Company's limits included Christchurch and Holdenhurst. There was a West Hants Water Company, who supplied part of the district; and it was proposed to them that an agreement should be arrived at apportioning the district between the two Companies. This proposal was adopted; and an agreement was included in the Bill which would effectually prevent overlapping. The Bill proposed to extend the Bournemouth Company's power of supply; and this extension was not opposed. There were two oppositions to the Bill; but they did not refer to the extension of boundaries. At the request of various bodies and persons, the Company were already supplying with water a considerable area outside their limits—notably the Branksome Park Estate. It was proposed to include this area within the authorized limits, and take land for construction of new works. The capital asked for was the sum which it was estimated would be required during the next fifteen years. Provision was made for the storage of gas north of the railway, and away from the better-class property; and there was no objection to the acquisition of the site for the purpose for which the Company desired to secure it. It was proposed to spend £224,000 on the supply of gas during the next fifteen years. As to water, having regard to the quantity they would have to distribute immediately and prospectively, new sources of supply were required. The Company had consulted a geologist. Under his advice, they had made a boring near the River Stour, at Wimborne, 220 feet deep; and pumping had shown that the supply would be very abundant. The water was, moreover, of great purity, and well fitted for dietetic purposes, as Professor Frankland had testified. There was a Water Company at Wimborne; and the promoters had undertaken, if the supply of water by this Company was interfered with by their pumping operations, that they would, so to speak, give Wimborne the first drink of the water they proposed to pump there. The promoters would take care that the Wimborne Water Company were not put in any worse position by the Bill than they occupied at present. The amount proposed to be expended for water purposes was £176,000; making in all £400,000, inclusive of the unexhausted, but exclusive of the issued, old capital. With regard to the petitions against the Bill, there had originally been eight. The Corporation of Bournemouth, however, having had considerable negotiations with the promoters, were content with the alterations made in the Bill, and were not opposing. The Poole Gas Company, the Poole Water Company, the Christchurch Gas Company, and the Wimborne Gas Company had also petitioned; but all these petitioners had been satisfied; as also were Mr. J. E. Cooper Deane and Mr. J. Cooper Deane. This left only two petitions—namely, that of Mr. Case and the Pokesdown District Council. Mr. Case had a cottage and garden adjoining the property on which new gas-works were proposed to be erected; and he alleged that his interests would be prejudiced by the Bill. But a remarkable feature of the matter was that it was the cottage which had come to the gas-works, and not the gas-works which had gone to the cottage. Moreover, it was not proposed to bring the gas-works nearer to the petitioner's property than they were at present.

Mr. RICKARDS asked what there was in the Bill to prevent the Company bringing their buildings nearer to the petitioner's garden.

Mr. BAGGALLAY said there was nothing; but he would give an undertaking in the Bill not to bring the buildings nearer to the garden than they were now, if that would satisfy his learned friend.

Mr. RICKARDS said that would not satisfy him at all.

Mr. BAGGALLAY then went through the petition of the Pokesdown District Council, which traversed the main proposals of the Bill on almost every point. At the request of Counsel on the other side, he dealt first with the petition of Mr. Case.

The following witnesses were then called:—

Mr. *Corbet Woodall*, M.Inst.C.E., said he knew the works of the Bournemouth Gas and Water Company, and the property of the petitioner. The only interference with it would be the odour usually arising from the manufacture of gas. But this discomfort was already existing; and the storage works could not be in any way an injury to the property. He thought the proximity of the cottage to the works was likely to enhance the value of the property rather than the reverse. There were sure to be people engaged at the works who would desire to get the cottage. To put a clause in the Bill providing for the compensation of the owner of the cottage in a case like this, or a clause requiring the Company to buy the property, would be an unprecedented proceeding.

In cross-examination by Mr. RICKARDS, witness said there was nothing in the Bill to prevent retort-houses and purifiers being brought close up to Mr. Case's property. The neighbourhood of the gas-works did not depreciate the value of the property; and if he were the owner of the cottage and the garden, he should know that he had no prescriptive right to have the land owned by the Company kept free from new buildings for his own enjoyment, and he should prefer to see the gas-works extended rather than have another row of cottages built behind. The presence of the works brought the possibility of employment to the door of Mr. Case's house, and also the possibility of the erection of shops in the neighbourhood. He was aware that, unless special provision was inserted in the Bill, Mr. Case would not obtain compensation for any injury he might consider was done to his property under the Bill. If a nuisance were caused by the storage of foul lime on the land near his cottage, or in any other way, he would have the ordinary legal remedy. Bournemouth was developing, no doubt, and so would the gas-works develop; and in course of time the whole of the Company's land would be utilized. But he did not think it would be done to the injury of Mr. Case.

Re-examined by Mr. BAGGALLAY, witness said that, under section 29 of the Gas-Works Clauses Act, 1847, the Company were not exempt from indictment for nuisance, notwithstanding anything contained in the Company's Special Act. The liability was the same with them as it would be with a private individual. If a private person owned the Company's land, and were to store on it (say) old bones from the slaughter-house, he could be stopped if it created a nuisance; and, in the same way, if the Company put anything on the land which caused a nuisance, they could be stopped. The gas-works were at the back of Mr. Case's cottage.

Mr. *E. H. Stevenson*, M.Inst.C.E., said he was acquainted with the Company's works. It was necessary to make preparations for extending them; and the site proposed was the only available suitable one, as it adjoined the present works. He did not consider that any injury would be done to Mr. Case's cottage. The utmost disadvantage would be that a small portion of his view at the back would be obstructed.

The front view was already cut off by electric light works, which had lately been constructed, and by a railway embankment. The cottage was one which would probably let at 5s. or 6s. a week.

Mr. RICKARDS: I am told that the manager of the gas-works has offered 8s. a week for it.

In cross-examination, witness said he did not think it mattered at all how much the gas-works were extended on the present site, so long as they were properly conducted. If they were not, the whole of the inhabitants of the neighbourhood would be up in arms in a moment.

Mr. BAGGALLAY said this was all the evidence he proposed to offer in regard to the petition of Mr. Case.

Mr. *F. G. Case* was then called and examined by Mr. RICKARDS. He said he was a railway porter, and was the owner of the cottage in question. It was one of four cottages, and was the farthest from the Company's coal shed. His experience of the gas-works at present was that, when the wind was in the west, a very unpleasant smell was brought to his house. There were 20 rods of garden attached to the cottage; and he had secured from his ground landlord a licence to build a shop there. He also had given the required notice of his intention to purchase the freehold of the property. As to the operations at the works, when the retorts were drawn water was thrown on the red-hot coke; and this produced a strong sulphurous smell, which was very unpleasant to the inmates of the cottage when the wind was in a certain direction. Coal dust in large quantities was blown from the works to his house; and if the works were extended as proposed in the Bill, the nuisance in this respect would be unbearable. The notice to the freeholder of his house of his intention to purchase required to be given before the end of the present year.

In cross-examination by Mr. BAGGALLAY, witness said he had only notified his intention to purchase the freehold in February last (although he had occupied the cottage five years); and notice of the Bill had been given to him on the 15th of December. He had had until December of this year to apprise his landlord of his intention to buy the freehold. He had all along intended to buy it.

Re-examined: He had spent £150 on his cottage in making roads, building outhouses, and so forth. He was in the happy position of expecting a legacy; and he intended to buy the freehold with it.

Mr. *G. White*, a cab proprietor, formerly a neighbour of Mr. Case, said his experience of the gas-works was such that he was glad to get away from them. He would not live there rent free now. The smells were very bad at times; and the coal dust was a great nuisance—so great that on certain days the windows could not be opened in consequence of the blacks flying about.

Cross-examined by Mr. BAGGALLAY: Mr. Case had told him years ago that he intended to buy the freehold of his cottage. He (witness), if the property were his, should not feel inclined to extend it; but another man might take a different view of the situation.

Mr. *F. Courtney*, a surveyor and estate agent of Bournemouth, said he knew Mr. Case's property, and was familiar also with the gas-works. He proceeded to give evidence (submitting a plan which he had prepared) as to the situation of the properties of the petitioner and the Company. He said the effect of the extension would be to depreciate the value of the petitioner's property, if the new works were put to the same use as the present ones. He estimated that the depreciation would amount to £150. The erection of the new works would lessen the market value of the cottage all round.

Cross-examined: To decrease the market value, there would have to be some increase in whatever objectionable conditions now existed. His estimate of £150 had been calculated on the freehold value; but he did not think the value would be much less if the property were regarded as leasehold. The ground-rent was £2 a year; and the purchase of the freehold merely meant the extinction of that rent. He considered the property worth £300, having regard to the licence which had been given to Mr. Case to build a house or a shop.

By the CHAIRMAN: The petitioner's cottage would let, he should think, at £20 a year, the landlord paying rates and taxes. It was worth £300; but if the Bill passed, it would not be worth more than £150. He had valued the property as leasehold. If he took it as freehold he should ask another £60.

The CHAIRMAN asked Mr. Rickards if he was applying for compensation for his client?

Mr. RICKARDS said he was, of course; though they were now discussing the preamble. He asked, in the first place, that the Committee should not pass the preamble; but if this were proved, he should apply for his client to be compensated.

Mr. BAGGALLAY said he would be satisfied if the Committee came to a conclusion at once as to whether, if they found the preamble proved, they would or would not require a clause put in for the protection and compensation of Mr. Case.

Mr. RICKARDS, continuing, said it was obvious that further construction of works meant injury to Mr. Case. His client's Solicitor had approached the Company in a friendly way, but they offered no compensation; and Mr. Case, who was a poor man, had to come before the Committee and incur enormous cost, in order to protect himself. Should the Committee believe that Mr. Case's claim was a good one, he (Counsel) should ask them to award him his costs.

Mr. BAUMANN said it had been laid down that, where a person was injured by the construction of public works, there should be no compensation; and the Committee were now being asked to depart from that policy, and put a special clause in the Bill for the benefit of Mr. Case. If the cottage were made impossible of occupation because of a nuisance, all that Mr. Case had to do was to go to a Magistrate and take out a summons against the Company. It was significant that it was only when Mr. Case heard that the Company were contemplating erecting new works that he gave notice to his landlord to acquire the freehold of his cottage. What damage had been done to the cottage was already done. Mr. and Mrs. Case had lived there for years, and their health did not appear to have suffered; and there was no reason to suppose it would suffer in the future.

Wednesday, May 6.

In opening to-day's proceedings, Mr. SHIRESS WILL said he desired to remind the promoters that he did not challenge the water undertaking part of the Bill, nor the estimates. Therefore, they might very well shorten their evidence. He proposed to call one or two witnesses, and to put the Pokesdown case briefly before the Committee; but he did not think he would occupy them very long.

Mr. BAUMAN said he was quite ready to meet his learned friend; but he had understood the previous day that the two points to which he wished to direct the evidence were the proposed expenditure of capital on the new water undertaking, and the public gas supply at Pokesdown. If that was still his learned friend's intention, he (Mr. Bauman) would put in the box witnesses to give evidence on these two points; but if this position had been abandoned, he did not know what his learned friend's was.

Mr. SHIRESS WILL remarked that Counsel on the other side said "the cost of our new works will be so-and-so." Well, that he (Mr. Shiress Will) admitted; but he should argue that, taking their own figures, what they asked for was too much. This was greatly a matter of observation; and if the other side liked to give evidence on the point, well and good. He did not, however, challenge the estimate for the working.

The CHAIRMAN: Neither as to gas nor water?

Mr. SHIRESS WILL: No. As regards the public lamps, that is a small matter. The Bournemouth Gas and Water Company charged one price in Bournemouth and another one in Pokesdown; and my argument is that we ought to be on an equal footing with the larger district.

Mr. BAUMAN thought the best thing for him to do would be to call evidence, on behalf of the promoters, to show the necessity of the extension of the limits of the Company, the nature of the proposed work, and the amount of the capital required.

Mr. SHIRESS WILL: I shall not cross-examine as to that.

Mr. BAUMAN desired to know what evidence the Committee wished to have in support of the preamble. If their estimates were admitted, their capital also must be admitted, for that was based on the estimates. If the extension of the gas and water limits was also conceded, he failed to see what opposition there was to the preamble. It seemed to him that the opposition reduced itself merely to a matter of clauses. If it was admitted that the promoters were to have this extension of limits, and if the estimates were admitted, the calculations of the promoters being based on that, he failed to see what his learned friend had to say on the subject.

Mr. SHIRESS WILL remarked that his learned friend had overlooked one or two points in the case. In the district of Pokesdown, which adjoined Bournemouth, they had "two strings to their bow," as regarded water supply. The Bournemouth Company had power to supply, and were supplying them at this moment; and the West Hampshire Water Company were also supplying them. The other side were asking in their Bill for power to extinguish the West Hampshire Company in portion of their district—namely, that of which Pokesdown was a part—and to give the Bournemouth Company the exclusive right to supply the district. He objected to this; and, shortly, his case was that if the Committee saw fit to sanction such a scheme, it should only be allowed on condition that the Pokesdown district be allowed to purchase that part of the undertaking on the usual arbitration terms under the Lands Clauses Acts—the most liberal terms that Parliament ever exacted. If his learned friend would call somebody concerned with the local administration of Bournemouth, he (Mr. Shiress Will) would put a few questions to him; and indicate his case after the other side had examined him. Then he (Mr. Shiress Will) would put forward his witnesses, and thus conclude his case.

Mr. BAUMAN did not see why the promoters should call anyone concerned in the administration of Bournemouth. It had never been suggested to the Company that they should put a clause in the Bill enabling the Pokesdown authority to acquire the part of the water undertaking which was in their district.

Mr. BAGGALLAY said he could not limit the case for the promoters. He must satisfy the Committee—as they were entitled to be satisfied—that the works proposed were necessary, both in regard to gas and water; and that the capital they proposed to take power to raise was required. They would also have to prove that it was reasonable, having regard to the work which had to be done, and to the capital which had to be raised, that the district should not be disintegrated; and he would have to put before the Committee a matter which he did not know the previous day—and one which perhaps his learned friend was not aware of, because it did not appear in his petition. It was this, that it was not a fact to say that they could get rid of the West Hants Company out of Pokesdown. Before this could be done, the Christchurch authority must purchase the West Hants Company; and then, and then only, could Pokesdown seek to go in and share in the spoils with Christchurch.

Mr. SHIRESS WILL pointed out that his learned friend could give formal proof of the points mentioned in his opening remarks.

Mr. *Corbet Woodall*, re-called, said that the quantity of gas made by the Company had doubled in the period of six years from 1887 to 1893, and on the average of the past 10 years it had grown at the rate of 10½ per cent. compound. He anticipated that there would be a very largely increased consumption in the next few years; and for the purpose of providing the gas necessary, further works were essential. It was the practice in gas-works to develop them from time to time; keeping, if possible, a little ahead of the requirements, so as to give a margin for working. Witness then proceeded to give evidence in proof of the figures mentioned by Mr. Baggallay in his opening speech the previous day. He added that under the auction clauses, it was usually provided that the sum required should be raised including the premium on the amount mentioned in the Act. In the Act of 1878, however, power was given to raise £150,000 by auction. Of this sum, £125,000 had been issued; and it had realized £146,000. If the balance had been raised, and it had reached the same premium, the capital of £150,000 would represent £187,500. The total sum raised under the Act instead of being £150,000, *plus* £37,500 on loan, would be £253,700. Dividends were paid on the nominal capital; and the premiums went into the concern as non-dividend paying capital, of which the consumer received the benefit. He estimated that the amount required by the Company for gas-works extensions would be £281,000, which left only £93,000 for the water-works. Having explained the working of the auction clauses, the state

of the existing works, the necessity for extension, the economical management and working of the Directors, and the excellence of the site for the proposed new gas-works, witness pointed out, in the matter of public lighting, that if the Pokesdown authority were not satisfied with the terms the Bournemouth Company gave them, they could take the Company to arbitration.

Cross-examined by Mr. SHIRESS WILL: Arbitration would not be expensive in a case of this sort; the issue being so simple. The tendency in Gas Acts was to do away with preferential rates as between two districts; but in the present case Bournemouth, as compared with Pokesdown, was allowed a rebate on the price of gas of 2d. per 1000 feet. This was justified by the fact that the supply of gas was more profitable in Bournemouth than in Pokesdown. That was always the case as between the centre of a district and an outlying portion of it. The cost of lighting was greatest in districts farthest removed from the Company's offices. In outlying places, very often every lamp had to be supplied from its own service-main; and that would cost a great deal of money. If there were a discrepancy between his figures and those of Mr. Baggallay as to the amount of capital required, it was not because he had altered his estimate. That was now precisely what it was three weeks ago.

Re-examined by Mr. BAUMAN, witness said there could not be many public lamps in Pokesdown.

By the COMMITTEE: The Bournemouth Company paid, on a small amount of their original capital a dividend of 13 per cent.; and on the remaining portion, 7 per cent. The Company was peculiar in respect that it had a sliding-scale which applied only to a small portion of the capital.

Mr. *E. H. Stevenson*, re-called, corroborated the evidence of the last witness. He said that the cost of the gas-works was £450 per million cubic feet of gas supplied. The cost in the case of Metropolitan and Suburban Gas Companies was, on an average, £650 per million. He thought, therefore, that £450 per million feet, in a place like Pokesdown, where great expense for railway carriage had to be incurred, was very low. The total amount of capital asked for in the Bill was not excessive; and would be expended in 12 or 14 years almost entirely on new plant.

Mr. *W. Cash*, the Secretary to the Bournemouth Gas and Water Company, gave evidence as to the terms on which the Company had offered to supply Pokesdown with gas. They had had a correspondence with the Pokesdown authorities, who had made several proposals. The final one was for 100 lamps to be erected in the Pokesdown district, and to be lit for a certain number of hours per night. The Company had got out an estimate of the consumption of gas, and had fixed the price per lamp for the supply. The mains were of various lengths; and the capital expenditure in laying them was estimated at £1326. The amount of gas which would be consumed per night was estimated at only 7000 or 8000 feet; and this the Company had worked out at a price of 3s. 6d. per 1000 feet. The Pokesdown authority were allowed the benefit of 30 per cent. reduction on this, and were then charged such a sum in addition as would make a return on the capital employed of 7 per cent. The Company had been informed that the number of private consumers which would be secured on these mains would be very small. They had offered to give Pokesdown the benefit of this supply; but if they had supplied at a cheaper rate than he had pointed out, they could only have done it at the expense of the Bournemouth part of the undertaking.

Mr. SHIRESS WILL, in cross-examination: If the Pokesdown Council are able to pay you for the part of your undertaking in their district, giving you Lands Clauses terms, what more do you want?

Witness: Even if we receive the best terms possible, we do not wish to dispose of part of our revenue-producing property. We have prospective profits.

If the Arbitrator thinks there is any additional amount which should be awarded to you on that ground, he will give it?—But the Company do not want to sell, even if they get the fullest value. No doubt the Company are disposing of part of their undertaking to the West Hampshire Company; but they are doing this to get rid of possible competition.

Mr. *E. Woods*, M.Inst.C.E., Engineer to the Bournemouth Gas and Water Company, stated that from the beginning, in 1885, the water supply was 212 million gallons per annum, which had increased in 1895 to 545 million gallons. He had estimated the cost of the well, buildings, mains, &c., at Wimborne at £86,000.

Mr. *J. Mansergh*, M.Inst.C.E., gave similar evidence.

Mr. *C. Hawksley*, M.Inst.C.E., stated that, in his opinion, there was no case for an arbitration clause in the Bill in regard to the water undertaking. The Christchurch authority might acquire the part of the South Hampshire Company's works which overlapped into the Bournemouth Company's district, it was true; but this would not give Christchurch the right to acquire the overlapping part of the Bournemouth Company's undertaking. The West Hampshire Company had not yet laid down mains in the Pokesdown district.

Cross-examined: The West Hampshire Company only obtained their powers in 1893. He did not know what they charged; but what they were authorized to charge was more than the amount which Bournemouth did charge.

By the CHAIRMAN: Bournemouth was supplying Pokesdown with water now; and they were supplying beyond that district. The capital asked for was to cover the entire area of the Company's supply, though the principal works happened to be in the northern portion of the area.

The CHAIRMAN: How much of the proposed £90,000 will be spent in Pokesdown?

Witness: That will depend on the relative requirements of the different portions of the district.

Dr. *E. Frankland*, F.R.S., was called to testify to the purity of the water which would be supplied from the new well at Wimborne Minster.

Mr. *F. Mead*, a Director of the Bournmouth Gas and Water Company, asked his opinion of the purchase clause proposed by Mr. Shiress Will, said the Bournemouth Company had been established to supply water over a certain area. All their works had been designed for the supply of that area; and if portions were to be lopped off, it would be most inconvenient. It would be dangerous to give the petitioners the power they sought, for other districts might come with the same request; and the result might be that the Bournemouth Company would be left with huge water-works but no one to supply. Then, even if a fair price were given for the Pokesdown part of the undertaking, a financial difficulty would arise. The Company would not know what to do with the money—what portion of the shareholders should be paid off, and so on. He was speaking from first impressions; for the proposal was quite new to him, and it had never been considered by his Board. Pokesdown was not a "dead end" of the Bournemouth Company's area of supply; the water passing through there to Southbourne.

Mr. SHIRESS WILL, in cross-examination: If you are prepared to sell a part of your undertaking to the West Hampshire Company, why will you not sell to us?

Witness: For the reasons I have given.

It comes down to this—that you do not like to change your investments?—That is one objection.

Is there any other?—Yes; that the Company would be left with considerable works, and no one to supply.

This closed the case for the promoters; and evidence for the petitioners was then called.

Mr. *Burt*, Clerk to the Pokesdown Urban District Council, examined by Mr. SHIRESS WILL, submitted a plan of the district he represented. He stated that it was largely increasing, and contained a number of superior houses. Formerly it was a rural district; but last year it became an urban district. The population—which was increasing—was 4000. Complaints as to the quality of the water supplied in the district had been made. The water was turbid; and it was discovered, after a time, that the circumstance was owing to a sediment in a "dead end" of the mains. The mains were flushed; and the evil was removed. His local authority were unanimously in favour of the acquisition of the water undertaking of the Bournemouth Company, so far as the supply to Pokesdown was concerned; and they were prepared to pay a fair price, to be settled by arbitration under the Lands Clauses Acts. With regard to the purchase of this part of the water-works dismembering the undertaking, the suggestion was absurd, looking at the smallness of the area and the extent of the Company's operations in other directions.

Cross-examined: The total rateable value of Pokesdown was £18,000; whereas that of Bournemouth was £350,000. The Pokesdown District Council had not consulted experts as to the purchase of the water undertaking; nor had they gone into figures as to what the expense would be. In the event of obtaining power to purchase the mains, he assumed that the water for the supply could be obtained from the West Hampshire Company. He had every reason to believe that his Council could be supplied with water in bulk by the latter Company at a cheaper rate than by the Bournemouth Company.

Mr. BAUMAN: Give me a reason for thinking that you could get water more cheaply from the West Hampshire Company?

Witness: Well, they are supplying Christchurch at 9d. per 1000 gallons. We have had no undertaking from the West Hampshire Company as to what we should be charged.

Are you aware that the water charges of the Bournemouth Company are about the cheapest in England?—I cannot say, not having seen a comparative statement. I know they are decreasing their charges.

If I tell you that we supply a house of £20 rateable value at 4½d. per 1000 gallons, will you admit that that is as cheap as it can be done?—If the supply is not by meter, I cannot admit your figures. Who knows that the house receives 1000 gallons for 4½d.?

Mr. *Bolton*, the Chairman of the Pokesdown Urban District Council, gave evidence as to the willingness of the authority to purchase the Pokesdown part of the Bournemouth Company's undertaking. He had in view not altogether the present requirements of the place, but their prospective necessities.

Cross-examined: He had not entirely calculated the cost of purchase, or of managing the water supply; but he thought it would be about half as much as the present expenditure.

By the COMMITTEE: He had reason to believe that the West Hampshire Company would supply Pokesdown with water at 6d. per 1000 gallons.

Mr. *Cooper*, the Chairman of the Finance Committee of the Pokesdown Urban District Council, stated that the subject of the purchase of the water undertaking had been carefully considered by the Council and by the public of Pokesdown; and the opinion was general that it would be a very good thing.

Mr. *Newbery*, the Secretary of the West Hampshire Water Company, said he was one of the parties to the present Bill, and was therefore in a delicate position.

Mr. SHIRESS WILL remarked that the witness appeared before the Committee on a Speaker's Order.

Witness said there would be no difficulty on the part of his Company in supplying Pokesdown with water. Their statutory powers were quite sufficient to enable them to do so.

Cross-examined: His Company had a capital of £50,000, and power to borrow over £12,000; but they had as yet only spent £14,000. They had settled the price of water at Christchurch six months ago—that was to say, the price to private consumers; but so far as the supply to the Railway Company, the Guardians, &c., was concerned, the rates would be varied, and were not yet settled. He had stated to persons interested in this inquiry that his Company would be willing to supply Pokesdown with water at 6d. per 1000 gallons, as they had offered to supply the Railway Company at 6½d. per 1000 gallons.

Mr. SHIRESS WILL then addressed the Committee for the Pokesdown Urban District Council. He pointed out that Pokesdown was now a small place. So was Bournemouth itself some years ago; but Bournemouth had increased, and there was no reason why Pokesdown should not do the same. Pokesdown made a most fair offer to the promoters of this Bill; being willing to pay not only the intrinsic value of the undertaking they were seeking to acquire, but its value as a going concern—that was to say, the intrinsic value with whatever sum in addition the Arbitrator might think it right to award them for compulsory sale. The argument that the proposal of the petitioners, if allowed, would dismember the Bournemouth Water Company's undertaking was not sound, for the reason that, under the terms of the Bill, the

Company were themselves proposing dismemberment. They were actually giving up a part of their area of supply to the West Hampshire Company under the agreement to which reference had been made which was to get rid of the overlapping character of the two undertakings. If the Committee were of opinion that he had made out a case for a purchase clause, he was willing to agree to this: If the officials of the House of Commons thought the Bill could not go through with the clause in it, he would assent to its being struck out; and would then go, without prejudice, to the House of Lords. The clause he proposed was as follows: "If at any time the Pokesdown Urban District Council are desirous to purchase so much of the water-works of the Company as is situate within the district of that Council, and of such desire shall give to the Company at least six months' notice in writing, the Company shall, at the expiration of such notice, sell that portion of the water-works, as the case may be (except the works mains and pipes or other apparatus which shall be necessary for supplying with water any other district or districts), at a price to be determined in default of agreement by arbitration, in manner provided by the Lands Clauses Acts: Provided that after the completion of such purchase, all powers and obligations on the part of the Company to supply water, as the case may be, within the said district shall cease and determine." In regard to gas, the learned Counsel said all his clients desired was that they should be placed on an equal footing with Bournemouth as to price.

Mr. LITTLER, replying for the promoters, said that the price of gas could be settled by arbitration under the ordinary law, if the petitioners felt aggrieved; and he therefore trusted that the Committee would not listen to the appeal made to them. As to the new clause proposed by Mr. Shiress Will, the officials of the House of Commons would consider whether it could be inserted in the Bill, irrespective of any assent his learned friend might give in the matter. Clearly they would not allow its insertion. He ridiculed the idea of a small parish like Pokesdown being capable of managing the water undertaking economically, seeing that it would be necessary for them to have a special and separate staff. If they were allowed the power they sought, every other parish supplied with water by Bournemouth might follow their example. Surely this appeal was bringing local government to the verge of the ridiculous. And it must not be forgotten that the petitioners had taken no expert evidence as to the cost of the undertaking, and did not know what price would be asked by the Bournemouth Company. They were prepared, in fact, to buy a "pig in a poke." It would be necessary for them to go to arbitration, where they would be saddled with heavy costs, which would fall on a community whose rateable value was under £5 per head.

The room was then cleared. When the public were re-admitted,

The CHAIRMAN announced that they found the preamble of the Bill proved. The petitions of Mr. Case and the Pokesdown Council, of course, fell to the ground.

THE BARNSLEY AND SHEFFIELD WATER BILLS.

The Competition for the Don Watershed.

It will be remembered that the dissolution of Parliament last year necessitated the suspension of the Bill promoted by the Barnsley Corporation to enable them to impound, for water-works purposes, certain portions of the watershed of the upper reaches of the River Don. The Sheffield Corporation, who, with the Corporations of Rotherham and Doncaster, strongly opposed the Bill in the House of Lords, have this session brought in a competing measure to impound the waters of the same tributary of the Don for the purpose of improving the supply of Sheffield, and have asked for power to supply Rotherham, Doncaster, and Barnsley in bulk. The two Bills came before a Select Committee of the House of Commons, presided over by Sir James Kitson, on Monday, the 20th ult. The various parties concerned were represented by a strong array of Counsel. The proceedings occupied the Committee continuously till the 27th ult., when Mr. Pope, Q.C., the leading Counsel for Barnsley, stated that they had been approached by Sheffield, and that there was a possibility of the inquiry being considerably shortened. He held in his hand a document purporting to be the heads of an agreement initialled by the Town Clerks of both Sheffield and Barnsley; but the document being marked "without prejudice," he would rather not place before the Committee the heads of the terms which had been so agreed to. Looking at them, he confessed that they appeared such as he ought to advise Barnsley to accept, even if they had not been initialled by their own Town Clerk; and shortly he might say that the parties had seen their way to an understanding by which the opposition to both Bills might reasonably cease. It was enough to say, in order to indicate the nature of the agreement, that there would be an application to the Committee on the part of both sides to adjourn, in order to give time to bring the heads of the agreement into statutory form. The Committee accordingly adjourned for a week. On the resumption of the proceedings on Monday, the 4th inst., Mr. Littler, Q.C., the leader for Sheffield, asked for a further adjournment to allow of the details being carried out. He said the parties had substantially agreed; but he should like the Committee to give them till Thursday so as to go through the clauses. In reply to an inquiry by Mr. Bonham Carter (the Referee), he stated that both Bills would have to go forward, but in a modified form. At the sitting of the Committee on Thursday, Mr. Pember, Q.C. (who appeared with Mr. Pope, Sir G. W. Morrison, and Mr. Page for Barnsley), informed the Committee that the agreement come to was, with certain modifications, one which had been settled on the 27th ult. He then proceeded to give the substance of it. The Sheffield Corporation agree, before using any of the water of the Little Don for their own purposes, to provide and send down all the stipulated compensation water. The Barnsley Corporation are, within three months after the completion by Sheffield of their Langsett reservoir, so that it is capable of storing water, to pay to the Corporation the sum of £19,148, as representing the saving to Barnsley by reason of Sheffield relieving them of their obligation, under their Bill, to send down compensaton water, and to meet the increased cost to Sheffield of the enlargement of the reservoir necessary to provide for such increased compensation. If the Midhope reservoir, authorized by the Barnsley Corporation Bill, be completed and brought into use for the purpose of supply before the Langsett reservoir, the Barnsley Corporation will, until the latter is finished, send down from the Midhope reservoir such quantity of compensation water and additional water as may be required; and the Sheffield Corporation are to pay to the Barnsley Corporation £4 per working day in the first year, to be increased by £1 in each succeeding year in respect of each working day on which the water shall be sent down—these payments to be made half yearly. The Sheffield Corporation are, within five years from the passing of the Sheffield Bill, to commence, and within twelve years to complete, the Langsett reservoir, and commence to discharge therefrom all the compensation and additional water which they are for the time being required to send into the Little Don; and if they fail to complete the reservoir within the period named, they are to indemnify the Barnsley Corporation. This Corporation are to pay a sum of £1589, being their proportion of the sum of £7748 payable by the Sheffield Corporation to Messrs. S. Fox and Co., Limited, under an agreement, in respect of loss of water power, and also to pay to the Sheffield Corporation, on the bringing into use of the Langsett reservoir, the sum of £2239 in respect of the capital outlay to be incurred by them in constructing the works necessary for pumping the additional water; and on the common amount of pumping the further sum of £4458, in respect of the capitalized value of the working expenses, including rates. The agreement places upon Sheffield the obligation to construct the Knoll Brook works, authorized by the Sheffield Bill; and they are to transfer them to Barnsley at cost price. Finally, it provides for the transfer of lands from one Corporation to the other by agreement or arbitration. Each Corporation will support the Bill promoted by the other; and if the Sheffield Bill does not pass this session, it is to become null and void. After some discussion, the Chairman announced that the Committee had passed the preambles of both Bills. The clauses were considered on the following day. The principal alteration effected was one at the instance of the Corporation of Rotherham, who obtained an amendment of a clause in the Sheffield Bill, so as to allow the Rotherham Corporation an extension of six years in the period for the repayment of their loans; making the total period 51 years from the present date. It appears that the capability of supply of the whole valley is equal to 8,500,000 gallons per day; and it will be apportioned as follows: Rotherham, 1,600,000 gallons; Doncaster, 1,000,000 gallons; Barnsley, 1,600,000 gallons—making a total of 4,200,000 gallons per day, and leaving 4,300,000 gallons available for Sheffield.

Newcastle and Gateshead Gas Bill.—Last Friday, this Bill came, on re-commitment, before the Committee of the House of Lords of which Lord Morley is Chairman. On the suggestion of his Lordship, consideration of the measure was adjourned for a week.

The London Water Companies Bills.—The Hybrid Committee on these Bills met yesterday week to choose a Chairman and to consider their course of procedure. Sir Joseph Pease was elected to preside; and it was agreed to meet to-day (Tuesday) for business. Alluding to the constitution of the Committee, "The Times" remarked last week: It may be noted that among the members appointed by the House to sit upon the Committee are Mr. Bond and Mr. Stuart, both members of the London County Council. According to the existing rule, the constitution of the Committee is perfectly regular; but it should be borne in mind that the Bills to be dealt with are of a contentious nature—involving, no doubt, large public interests, but at the same time dealing with private interests of great importance, and that the London County Council has taken up a position adverse to the Water Companies. It is a matter worthy of consideration whether an ordinary Private Bill Committee, carefully selected, would not have better served the ends of justice. According to May's "Parliamentary Practice" (10th Ed., p. 726) the members on a Hybrid Committee are not subject either to the declaration that they are not locally or personally interested, or to the rule as to attendance. (Standing Orders 118 to 120). In the absence of these conditions, the judicial character of the tribunal is obviously impaired. Further, the Chairman, who is best able to form a just opinion on the merits of the case, can only vote when there is an equality of voices.

The Proposed Amendment of the Metropolitan Counties Water Board Bill.—The above-named Bill will be in Committee on Monday next, when Lord James of Hereford will, in accordance with his observations on the second reading, bring forward certain amendments. Towards the end of clause 4 of the Bill, it is specified that any person authorized by the Water Board to do so may enter and inspect any premises within the Metropolitan Water Area, "for the purpose of ascertaining whether there has been any violation of the enactments with respect to the supply of water within that area." After the word "violation," Lord James proposes to insert "by any Metropolitan Water Company." The following additional clause, giving power to any county council to apply to withdraw from the Board, it is proposed to insert after clause 7: "(1) The council of any Metropolitan County may promote a Bill in Parliament for the purpose of providing or controlling (whether by virtue of any agreement with the Water Board or otherwise) a water supply for their county or any part thereof; and any such Bill may provide for the withdrawal of the representatives of such council from the Water Board, and for making any consequential alteration in the Metropolitan Water Area and in the provisions of this Act. (2) In the event of the Water Board promoting any Bill in Parliament for the purpose of acquiring or controlling the undertaking of any Metropolitan Water Company, or of procuring a fresh supply of water to any part of the Metropolitan Water Area, the council of any Metropolitan County may apply to Parliament for the insertion in such Bill of provisions enabling that council to withdraw their representatives from the Water Board, and to acquire such portion of any undertaking proposed to be acquired under the Bill as is situate in their county, and may reasonably be considered to be exclusively required for the part of the county which was previously supplied by the undertaking, and for making any consequential alterations of this Act."

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Thursday, May 7.

(*Before Mr. Justice* KEKEWICH.)

The Sunlight Incandescent Gas-Lamp Company, Limited, v. The Incandescent Gas-Light Company, Limited.

Mr. C. E. E. JENKINS (with whom was Mr. GRAHAM HASTINGS, Q.C.) moved on behalf of the plaintiffs for an interim injunction to restrain the defendants from advertising or publishing any statement that the incandescent mantles made or sold by the plaintiffs were an infringement of the defendants' patent; from publishing any untrue or misleading statement concerning the plaintiffs' mantles; and from "threatening with liability the customers of the plaintiff Company, or other persons, in respect of the purchase or use of the plaintiff Company's mantles." The learned Counsel stated that, in successive actions tried before Mr. Justice Wright and Mr. Justice Wills, it had been decided that the mantles of the present plaintiffs were not an infringement of the patent of the defendant Company; yet that Company had issued misleading advertisements and circulars to induce the public to believe that the plaintiffs had infringed their patent. This had led to the present motion.

Mr. A. J. WALTER, for the defendants, asked that the motion should stand over for time to answer the plaintiffs' affidavit, which he had not seen.

Mr. JENKINS submitted that, if the motion was to stand over, the plaintiffs ought to have an undertaking on the part of the defendants not to threaten the plaintiffs' customers in the meantime.

Justice KEKEWICH: It is not desirable the threats should continue pending the trial of the action.

Mr. WALTER: We have not done anything of the kind.

Justice KEKEWICH: That is all the more reason why you should undertake not to do it. If there is a suggestion of threats, it is desirable that the threats should not continue while the matter is *sub judice*.

Mr. WALTER: The plaintiffs have themselves wholly misstated the proceedings before Mr. Justice Wills.

Justice KEKEWICH: It is suggested—I do not say proved—that, pending this litigation against you, you are threatening the plaintiff Company's customers, or others, and preventing persons from dealing with them pending the decision whether the patent is their property or not. Surely that is the proper subject of an undertaking.

Mr. WALTER: I do not mind giving the undertaking, if the plaintiffs on their part undertake to make no public use of it.

Justice KEKEWICH: They must not do that. The defendants will give an undertaking over to-morrow week not to threaten the plaintiffs' customers or other persons in respect of the purchase or use of the plaintiff Company's mantles. On this undertaking, the motion will stand over till the 15th.

GODALMING COUNTY COURT.—Friday, May 8.

(*Before His Honour Judge* VERNON LUSHINGTON, Q.C.)

Eaton v. Godalming Gas Company.

To-day, his Honour held a special sitting to hear the above-named case, in which the plaintiff sought to recover damages for injury to her health alleged to have been caused by an escape of gas from the defendants' pipes.

Mr. L. J. M. de MICHELE appeared for the plaintiff; Mr. W. B. CLODE represented the defendants.

Mr. DE MICHELE said the plaintiff was a sister of the landlord of the Railway Hotel, near Godalming Old Station, and was her brother's housekeeper. On or about the 31st of October last, she had to be in the bar on the ground floor, and also in the room above the bar, facing due west. A disagreeable smell had been perceived for some time; but it became worse on the 31st of October. A plumber was called in; and he found the pipes on the premises in a satisfactory condition. The smell continued from that time up to the 15th of November. On the plumber reporting that, so far as the hotel premises were concerned, there was nothing defective in the pipes, a complaint was made to the Manager of the gas-works (Mr. S. Bark) on the 4th of November. He said he would have the matter seen to; and on the following day, two workmen came, and after examining the ground outside the hotel, said the leakage proceeded from a lamp belonging to the South-Western Railway Company. The Railway Company's men thoroughly examined their pipes and gas arrangements, and reported that the escape had nothing to do with the lamp belonging to the Company. Mr. Bark was again communicated with; and on the 13th of November workmen came again and tested the pipes, and ascertained that the leakage was from pipes about 44 feet from the hotel. On the 15th of November, plaintiff became seriously ill, and a medical gentleman was called in, and attended her until the 13th of January. The doctor described the illness as gas poisoning. The three points he thought his Honour had to consider were: (1) Was there a poisonous escape of gas? (2) Was plaintiff injured by it? (3) Were defendants liable?

Mr. CLODE submitted that there was no negligence on the part of the Gas Company. As a matter of fact, their attention was first called to the smell on the 5th of November. They went to the premises, and found a slight escape in the station approach. The mere evidence of a broken pipe was nothing; but, without negligence, there was no liability on the part of a statutory company.

Mr. DE MICHELE quoted the case of *Fletcher v. Rylands* to show that a gas company were responsible in the same way as a private individual for any damage that might occur. The Gas-Works Clauses Act, he said, particularly put gas companies out of the statutory exemption from liability for damage not caused by negligence. He further urged there was negligence, as the Company had sufficient notice to prevent to a great extent the injury done to plaintiff.

Evidence having been given by the plaintiff, her brother, the potboy at the hotel, and the medical man who took the case in hand,

Mr. CLODE, dealing further with the legal aspects of the matter, quoted the case of *Beale v. Chelsea Water-Works Company*, to show that a statutory company were not liable except for negligence.

The Court then adjourned. On resuming,

His HONOUR said in the last case cited it was held that the doctrine laid down in *Fletcher v. Rylands* was not to be extended. That was not a case of a company carrying on business under statutory powers, but of a private individual storing water for his own purposes.

Mr. DE MICHELE remarked that there was no extension of the law there, because the Act he had quoted specifically said they were liable for any damage.

His HONOUR said he could not go against the judgment of the Court of Appeal. The only question was whether Mr. Michele asked him to amend by adding a charge of negligence.

Mr. DE MICHELE said he did.

Mr. CLODE then called evidence for defendants.

Benjamin Bark, a foreman employed by the Gas Company, said that on the 4th of November they had notice of a leak near the Old Station; and on the following day they tested within 2 ft. 6 in. of what afterwards proved to be the source of leakage. On the 16th of November, they found a 2-inch main broken. The pipe was in a good condition, and it had been broken owing to a subsidence in the sewerage trench which crossed it.

Mr. *S. Bark* also gave evidence as to instructing his son to search for the escape.

George Smith, a main layer and blacksmith, in the service of the Company, deposed to examining the ground round the hotel until the 16th of November.

Mr. DE MICHELE contended that the period which existed between the 4th and the 16th of November—the admitted date of the repair of the broken main—showed negligence, even if the efforts the last witnesses made were persistent or were from day to day; and their method of making the tests would not absolve them from negligence.

His HONOUR, in summing up, reviewed the evidence, and said he could not hold that the Company had shown negligence, unless it was satisfactorily proved that they had been guilty of some want of ordinary care and diligence. He had no such evidence in this case; and therefore he must give judgment for the Company, with costs.

CAMBRIDGE COUNTY COURT.—Wednesday, April 29.

(*Before His Honour Judge* BAGSHAWE, Q.C.)

Lucas v. Cambridge Corporation.—Damaging a Gas-Pipe by Sewerage Works.

To-day his Honour had before him an action brought by Mrs. Elizabeth Ann Lucas against the Corporation of Cambridge, for compensation for personal injuries and damage to furniture caused by an explosion of gas which took place on the 5th of December last.

Mr. JOHNSON appeared for the plaintiff; Dr. COOPER represented the Corporation. Dr. PANKHURST was in attendance on behalf of Mr. Nuttall, the contractor for certain sewerage works of the Corporation, which it was alleged had caused the explosion.

Mr. JOHNSON, in opening the case, submitted that the injuries to the plaintiff and the damage to her furniture and goods were due to the negligence of the defendants, their servants or agents. He said that about November last year, the defendants were engaged in constructing a sewer along Fair Street, Cambridge; and for that purpose they employed a contractor, who dug a trench in the street. In so doing, a service-pipe from the gas-main to No. 2 in the street was laid open and cut under, and a water-pipe was also injured. No gas was laid on to the plaintiff's house (No. 3). After the trench had been filled up, the soil sank, bent the pipe, and broke it away from the main. Gas escaped, and found its way into No. 3. On the morning of the 5th of December, the plaintiff went out of her house and returned about six in the evening, when she detected the presence of gas. After having opened the doors, she made a fire, and almost immediately a violent explosion occurred. The kitchen boiler was blown out, and also the back door; and the furniture and crockery in the kitchen were broken. The roof was lifted, and the walls cracked, and £5 was claimed in respect of the time in which plaintiff was unable to live in the house. She was knocked down, burnt on the arms, face, and legs, and her knees were cut—one of them rather severely. He contended that it was the duty of the Corporation to see that such pipes as the one in question were not injured.

Dr. COOPER admitted that, if negligence was proved, the defendants were liable.

Charles Hunt, a foreman employed by the Cambridge Water Company, said he saw the sewerage works while they were in progress in Fair Street. The trench that was dug passed the door of No. 3, and was from 12 to 14 feet deep. He saw a gas-pipe in the trench, about 12 or 15 inches from the surface. The trench, which was something like 3 feet wide, was about 2 ft. 6 in. from the nearer side of the main. The service-pipe was not supported in any way while the sewerage operations were going on.

Cross-examined: It might have been in October that he saw what he had given evidence about, or the trench might have been filled in by September. There were other service-pipes exposed as well as the one in question, which went to No. 2. The distance from the trench to the house would be 9 or 10 feet.

Re-examined: After the explosion, he saw, in the re-opened trench, the same pipe bent downwards from 9 to 12 inches out of its proper position. He also saw that it was pulled from the main. The soil under the pipe was partly soft clay. One of the water service-pipes was split at the edge of the cutting, and had to be repaired. The water-pipe would not have been bent as it was if the trench had been properly filled in.

Mr. *E. A. Dunn*, Assoc.M.Inst.C.E., produced a plan and section of the street, and spoke to their correctness.

Plaintiff was then called, and bore out the statement made by her Counsel. She said the explosion occurred about 15 minutes after her return home on the 5th of December. It knocked her infant off her

knees; and she herself was burnt, and had since suffered from impaired health. The tenancy of the house did not expire till Lady-day; but the place was uninhabitable for some time after the explosion.

Cross-examined: Some of the furniture was so much damaged that it was burnt as firewood, and a portion was sold. She went back to the house about two months after the explosion, and lived in it until just before the 25th of March. She made an application to the Gas Company for damages. She never used a benzoline lamp or stove. There was a smell of paraffin after the explosion; but there was no oil in the house except that which was in the lamp. She smelt gas in the pantry on the previous Sunday. When the explosion occurred, the floor of the kitchen and the table were blown up, and bricks were dislodged from the hearth.

Police-constable *Witham*, who visited the house after the explosion, described the damage done to it and its contents.

Dr. *Greer* and Mrs. *Collins* testified to the injury caused to the plaintiff's health by the explosion.

Mr. *O. J. Weeks*, the Manager of the Cambridge Gas Company, said that, on the 6th of December last, he went to No. 3, Fair Street, and found the house in a wrecked condition. He could not see how the wreckage had been caused; so he at once caused the main and service pipes to be stripped and examined. He found the service-pipe of No. 2 detached from the main, and considerably bent.

In answer to his HONOUR, witness explained that the gas might have entered the house by a gully. When the fire was lighted, it would bring fresh gas up from the floor. The damaged state of the house could not have been caused by an explosion of lamp oil; and he could not account for the explosion except by gas.

Cross-examined: The pipe was an old one; but there was no indication of it being decayed. It would require considerable force to detach it from the main. The main was only about a foot from the surface of the road; but the escaping gas could take a downward course. He accounted for its descending instead of ascending by the ground being hardened.

Frank Freeman, fitter in the employ of the Gas Company, said he uncovered the service-pipe and main after the explosion, and found the end of the pipe had been dragged from the main about an inch.

Mr. *W. W. Gray*, Assoc.M.Inst.C.E., the Manager of the Water Company, said he saw the service-pipe in question bent down about 11 inches. This might have been caused by a settlement of earth in the trench; and there were evidences of such settlement.

This concluded the case for the plaintiff.

George Robins, who was foreman to the contractor while the sewerage operations were being carried on in Fair Street, was then called. He stated that the trench was begun about the 11th or 12th of September, and was filled up by the 22nd of that month. While the work was being done, neither the gas nor the water main was exposed. The gas and water service-pipes both crossed the trench; but there was no escape from either of them. The trench was filled up with earth and clay mixed, which was thrown in and rammed. On or about the 5th of December, he noticed a slight subsidence nearly opposite No. 3; and this was afterwards filled up with flints. No opening was made to try to find the cause of the subsidence. Witness did not receive any complaints about the escape of gas, nor did he smell it.

Cross-examined: The subsidence might have been 3 or 4 feet deep. There were no special supports put under the two service-pipes—in fact, they were not supported in any way whatever.

Mr. *G. Parkin*, the Resident Engineer to the Corporation, said the sewerage work in Fair Street was done by open cutting; and he inspected it from time to time. The supply-pipes on the west side of the road were exposed. All the ramming was done properly, as far as he could judge. He did not receive any complaints about the escape of gas or water; neither did he notice an escape. He visited the scene of the explosion four days after it occurred. The gas-main on the east side of the trench was then open. He considered that the gas reached the house No. 2 through a pipe, and then escaped.

Mr. *Weeks*, re-called, said that No. 2 had been unoccupied several weeks before the explosion; and the supply of gas had been cut off close to the wall inside the house.

Dr. COOPER then addressed his Honour for the defendants. He submitted that the plaintiff must prove beyond any doubt that the accident and explosion occurred as the result of negligence on the part of Mr. Nuttall or some of the men employed by him. There could be no doubt that the escape of gas was caused by the pulling away from the main of the service-pipe to No. 2; but he did not think any evidence had been given upon which it could be reasonably said that plaintiff had established beyond question that the escape was caused by anything over which the defendants had control.

His HONOUR said he was of opinion that the plaintiff's case had been clearly made out; and he gave judgment for her for £43 and costs on the higher scale.

Stealing from Prepayment Meters.

At the Lambeth Police Court last Thursday, John Ingarfield and Robert Lewis were charged, on remand, with being concerned together in stealing money belonging to the South Metropolitan Gas Company from an automatic gas-meter fixed at No. 35, Graylands Road, Peckham. There were several other charges against Lewis alone. Mr. Washington prosecuted on behalf of the Company, and Mr. W. H. Armstrong defended Ingarfield. The particulars of the case were reported in the "JOURNAL" last week. Some additional evidence was now given, and an *alibi* set up on behalf of Ingarfield. Mr. Denman committed the prisoners for trial; but he offered to admit Ingarfield to bail—two sureties in £20 each, or one in £40.

The Rating of the Lambeth Water Company's Reservoirs.

At the Kingston Petty Sessions, on the 30th ult., before Mr. J. F. Eastwood and other Magistrates, the Lambeth Water Company were summoned by the Molesey District Council for £238 3s. 6d., the amount of a general district rate made on Nov. 22, 1895. Mr. Scarlett, who appeared for the Council, said the rateable value of the property was £5200; and the rate now demanded had been validly made upon that sum. Mr. Horace Avory contended that, under section 211 of the Public Health Act, a local authority had no option but to assess "land covered with water" at one-fourth the rateable value. If the Bench were of opinion that the reservoirs in question, which he maintained were "land covered with water," had not been so assessed, the rule was invalid, and bad on the face of it. Mr. Scarlett said Mr. Avory was merely asking the Court to assume that the District Council had not made any allowance for the reservoirs as "land covered by water." But he had not produced any evidence to show how the assessment had been arrived at; and it was not necessary that it should be shown in the rate-book. After some private consultation, Mr. Eastwood said the Bench felt bound to make the order for payment, but they were quite willing to state a case. Mr. Avory asked them to do so.

The Brighouse Corporation and the Elland Edge Water Company.

At a recent sitting of the Halifax County Court, his Honour Judge Cadman had before him an action by the Brighouse Town Council against the Elland Edge Water Company to recover £41 11s., alleged to be due for water supplied and for meter-rents. Mr. Storey, who represented the plaintiffs, remarked that originally a private Company at Rastrick supplied the defendant Company; the charge then made being 2s. per 1000 gallons. Ultimately, however, the Rastrick Company were taken over by the Local Board of that place, who were prevailed upon to reduce the charge to 1s. Brighouse and Rastrick had since become incorporated. As a Corporation, the plaintiffs were not obliged to supply water to anyone outside their own area; and, indeed, they had not the power to do so, without the consent of the adjoining district. Elland Lower Edge was in the area of the Elland District Council. The Brighouse Corporation were supplying their customers within the borough at 8d. per 1000 gallons; and the defendants seemed to think that they should be allowed water at the same rate. It would be manifestly unfair, however, to the Brighouse ratepayers if they were charged less than 1s. As a matter of fact, they were being supplied at a less cost than ratepayers in the borough, considering that higher rates had to be paid at Brighouse than at Elland Edge. The real grievance of the Company, the Corporation believed, was that they had refused to purchase their plant. It was only when this refusal was given, that the charge of 1s. was objected to. Mr. C. E. Shackleton, Borough Accountant and Assistant Town Clerk, deposed that the charge of 1s. was paid by the defendants up to September, 1894. There were other out-districts which were paying 1s. 3d. per 1000 gallons. For the defence, Mr. Evans urged that, as to £20 11s. of the claim, the Corporation were barred from recovering the money. The Water-Works Clauses Act prescribed that proceedings to enforce payment must be taken within six months from the time of the demand being made. In the present instance, this period had been permitted to elapse. Mr. Storey, in reply, contended that the limit as to time referred only to cases within the borough; to water supplied outside the borough, the Act did not apply. Mr. Evans retorted that, if Elland Upper Edge was not supplied by the Corporation under the Act, then the Corporation were in this dilemma, that they had no power to sue at all. His Honour, he submitted, had also no jurisdiction as to another item. In that instance, the meter only registered 20,000 gallons; and the Corporation altered it to 158,000, to bring up the consumption to that of the corresponding quarter of the previous year. He maintained that, as it was the Corporation's duty to keep the meter in order, they were not entitled to do this without the authority of a Court of Summary Jurisdiction. As to the merits of the case, he submitted that the defendant Company were entitled to be supplied at the same rate as the Brighouse consumers; and every quarter the Corporation had been tendered payment at the rate of 8d. per 1000 gallons. His Honour reserved judgment.

Liability for Water-Rates during Intermittent Supplies.

The condensed report of the case which came before his Honour Judge Percy Gye at the Basingstoke County Court, as reported in the "JOURNAL" for the 21st ult., does not, a correspondent points out present the full significance of the proceedings taken by the Town Council against Mr. E. Andrews for the recovery of a water-rate, inasmuch as the defence practically rested on the admissions made by the witnesses called on behalf of the Corporation at the Local Government Board Inquiry (see "JOURNAL" for Nov. 19, 1895), which admissions were tantamount to saying that the proposed new water-works were necessary because the supply was not adequate. There was no reference to failure owing to frost or breakdown, but a plain and simple case that the defendant was called upon to pay for a supply of water which he only received intermittently on account of the Corporation not possessing plant powerful enough to provide a continuous supply to the high levels of the town. The following is his Honour's judgment, and it will be seen that it contains some important points, which could not be fully brought out in a brief *résumé* of the proceedings, but which are worth recording.

His HONOUR (refusing to hear the evidence of the defendant, and addressing Mr. Wills Chandler, his advocate) said: I should like to hear you on this point: Assuming that the defendant succeeds in satisfying me that the supply was insufficient, is that an answer to a claim for a rate? I will tell you what strikes me about it, and it may clear your mind. The Corporation are entitled to impose this rate; and the omission by them to do something which they are bound to do, and in respect of which they are entitled to impose the rate, is no answer to a claim by them against one of the ratepayers. It seems to me that the same principle governs this case that governs other corporation cases, and that is where a corporation or public body are bound to do certain acts, and they do not do them, no action will lie by any person who is injured by that omission. It is a case of nonfeasance. But where an act done is a case of misfeasance, as where a corporation surveyor

leaves a heap of stones in the middle of the road, that is actionable. Where he omits to repair a hole in the middle of the highway, that is a case of nonfeasance; and no action lies. An omission to perform the duty of supplying water is a mere act of nonfeasance; and I do not think any action would lie against the Corporation for their failing to supply. If they supplied poisoned water, then probably an action would lie, being misfeasance; but an omission to do what they are bound to do, being mere nonfeasance, would not render them liable to an action for damages. Upon this point, if it were solemnly argued out, I do not think the defendant would succeed in the defence he now sets up. The fact of the Corporation being entitled to impose a rate gives them an absolute right to claim that rate; and it is no answer to say that they have not fulfilled their obligation. Have you anything to say on that point?

Mr. WILLS CHANDLER said it seemed to him that, according to his Honour's opinion, the defendant would be liable for the rate, even if the Corporation did not supply him with water at all.

His HONOUR said that was his opinion.

Mr. WILLS CHANDLER said he put it as a question of statutory liability on the part of the Corporation to supply the water; for, under section 55 of the Public Health Act, 1875, "a local authority shall provide and keep in any water-works constructed or purchased by them a supply of pure and wholesome water." The Editors of "Michael and Will" stated that "water-works" included the pipes for the domestic use of the inhabitants. If there were a supply of water in the pipes, it would have been conveyed into the defendant's house.

His HONOUR said the breach of duty might be one for which the Corporation might be indicted, but all the same not be liable to an action for damages.

Mr. WILLS CHANDLER pointed out that section 56 of the Public Health Act provided that, "where a local authority supply water to any premises, they may charge in respect of such supply a water-rate to be assessed on the net annual value of the premises." The supply to the premises was a condition precedent to the making of the rate; and his contention was that his client was not responsible for any portion of it if the supply were not given.

His HONOUR: In this case, I think there must be judgment for the Corporation. I consider that the omission to supply water—if omission there were—cannot be relied upon by the defendant in answer to the application for the water-rate. The Corporation have statutory powers, under the Public Health Act, 1875, to make a rate which is to be founded upon the rateable value of each house they supply, which rate they can enforce by the usual statutory powers given to corporations. The failure of the Corporation to supply is, in my view, no ground upon which any ratepayer can refuse to pay the rate.

West Bromwich Gas Supply.—The Gas Committee of the West Bromwich Corporation, in their report presented to the Town Council at their meeting last Wednesday, stated that the sale of gas during the financial year ending March 31 last was 215,005,600 cubic feet, as compared with 205,752,100 cubic feet in the previous year; and the amount of gas-rental was £27,299 10s. 3d., as against £26,147 7s. 7d. in the year 1894-5.

St. Ives Corporation Gas-Works.—The gas-works at St. Ives, Cornwall, which were acquired last year from a private Company, have undergone almost complete reconstruction, and have now been brought thoroughly up to date. The work has been carried out by Messrs. Willey and Co., of Exeter, from the designs and under the superintendence of Mr. J. W. Buckley, the Engineer of the Falmouth Gas Company. Last Wednesday, the works were formally opened by the Mayor (Mr. E. Hain), in the presence of members of the Corporation and other gentlemen. Mr. Buckley described the alterations which had been carried out, and said the work had been completed by Messrs. Willey to his entire satisfaction. The Mayor also complimented the Contractors as well as the Consulting Engineer, and said it was a gratifying fact that for the first twelve months the works had more than paid their way. He was in favour of corporations acquiring water and gas works; and he believed that this undertaking would be of financial benefit to the ratepayers. His Worship subsequently turned on the gas into the mains, and was thanked by Mr. Willey for performing the ceremony, and presented, in the name of the firm, with a silver cup in commemoration of the event.

Two Servants Suffocated through a Defective Gas-Bracket.—Dr. Danford Thomas was engaged at the Hampstead Provident Dispensary last Wednesday week in investigating the painful circumstances attending the death of two servants (Ann Stephenson, aged 53 years, and Kate Lydia Lane, aged 13 years), who were poisoned by gas at 96, Broadhurst Gardens, South Hampstead, on Saturday, April 25. Mrs. Matilda Mackey, the mistress of the deceased, stated that they had been in her employ as cook and housemaid respectively. Ann Stephenson had only been in her service for a week, and did not thoroughly understand the working of the place; but Kate Lydia Lane had been there ten weeks, and knew the place well. On the night of the accident, the housemaid went to bed about 9.30; and the cook followed at about eleven, taking with her a safety lamp and a candle. It was witness's custom to have a cup of tea in bed; but as this did not appear on the Saturday morning, she became suspicious, and went to the servants' room. On opening the door, she was driven back by a strong volume of gas. After this had cleared off a little, she went into the room and opened the window. It was then discovered that Ann Stephenson was dead; while her companion was in an unconscious condition. Witness had the latter at once removed to a room downstairs; but she died shortly after. In answer to the Coroner, Mrs. Mackey added that the gas was turned full on; but it was an act of disobedience if the servants had done it, as they had been strictly forbidden to do so—the gas-bracket not being in proper order. Mr. E. Mackey said that since the fatality he had examined the bracket and found that the stopping which had been put in to prevent the flow of gas had been slightly shifted. Dr. Jackson, who was called in to attend to the unfortunate women, said he found Ann Stephenson dead, and Kate Lydia Lane suffering from a bad form of blood poisoning produced by gas. She never rallied, and died shortly after his arrival. A verdict of "Accidental death" was returned in both cases.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Ordinary General Meeting of the proprietors in this Association was held at the Cannon Street Hotel, London, E.C., on Tuesday last, under the presidency of Mr. T. H. GOODWIN NEWTON.

The SECRETARY (Mr. R. W. Wilson) read the notice calling the meeting, and the following report of the Directors:—

The present half-yearly ordinary general meeting of the proprietors has been convened in conformity with the Association's Acts of Parliament, for the purpose of receiving a report from the Directors upon the affairs of the Company, and of declaring a dividend for the half year ended the 31st of December last.

Before entering into a statement of the general affairs of the Association, the Directors desire to mention an event which has occasioned great grief to them—a grief which they are sure will be shared by all the proprietors—the death of the Rt. Hon. Sir Julian Goldsmid, Bart., M.P. He had been obliged by illness to retire from the Board a few weeks before his death; and, as the proprietors are aware, he had been for 27 years a Director, and during the last 20 years Chairman of the Board. It is unnecessary to dwell upon the eminent services rendered by Sir Julian, and the obligations under which he has laid the proprietors. A testimonial in acknowledgment of those services had been prepared; but unhappily his death occurred before the presentation could be made. But the Board feel that the proprietors will approve of this record of his services being included in their report.

The following summary shows the results of the Association's operations during the half year under review: The quantity of gas made in the half year ended the 31st of December last was 4591 million cubic feet; the quantity made in the corresponding half year of 1894 was 4478 million cubic feet—being an increase of 113 millions, or at the rate of 2½ per cent. The total number of lights on the 31st of December last amounted to 2,328,313; there being at that date 175,384 consumers on the books of the Association. At the close of the corresponding half year of 1894, the number of lights was 2,217,569, which gives an increase of 110,744, or at the rate of 5 per cent. The entire length of mains laid on the 31st of December last was 1834 miles; the length of mains laid on Dec. 31, 1894, was 1793 miles—an increase of 41 miles.

The above figures sufficiently show that the business of the Association is steadily growing, notwithstanding the competition of mineral oil and of the electric light. The economy in the consumption of gas, obtained by the use of the incandescent gas-burner, which is very largely employed on the Continent, has to some extent affected the increase in the consumption of gas; but the Directors have reason to think the Association will ultimately benefit by this improved system of lighting. The efforts of the Directors, ably assisted by their officers, in promoting the use of gas for other purposes than lighting, have met with a large measure of success; and this department of the business is daily growing in importance.

The Directors have the pleasure to report that the receipts for gas for the half year under review show a fair increase upon those of the corresponding period of 1894, and that the profit also is somewhat higher.

The revenue obtained from the sale of coke and tar exhibits a substantial improvement; but against this, however, must be set a decrease in the receipts for ammoniacal liquor and the products derived therefrom.

The average cost of coal for the period under review is slightly higher, owing to a new stipulation in the contracts with the Associated Owners of the German Collieries, that a higher price be paid for coal delivered in the winter than in the summer months.

The plant and mains at all the stations were maintained in a due state of efficiency.

The Directors have sold land for which there was no further use at Aix-la-Chapelle, Amsterdam, and Rotterdam, and have purchased a small plot of land contiguous to their Erdberg works at Vienna.

Under the terms of the Association's contract with the City of Amsterdam, the right was reserved to the Authorities to terminate the concession and take over the works by purchase on and after Aug. 1, 1897, provided notice of their intention to do so be given to the Association at least two years previously. This notice was given on the 16th of July last.

The vacancy created on the Board by the retirement of Sir Julian Goldsmid was filled by the election of Sir Charles James Jessel, Bart.

The Directors desire, in conclusion, to draw the attention of the proprietors to the accounts for the half year ended Dec. 31 last. These have been duly audited; and from them the Directors have, in accordance with the provisions of the Companies Clauses Consolidation Act, prepared a scheme showing the profit of the Association for the half year, and the portion thereof applicable to the purposes of dividend, which they recommend now to be declared—viz., a dividend of 5 per cent. for the half year ended Dec. 31 last, and a bonus of 1 per cent., both payable, free of income-tax, on and after Tuesday, the 12th inst.

The Directors who go out of office by rotation are John Horsley Palmer, Esq., Robert Tindall, Esq., and Sir Charles James Jessel, Bart. These gentlemen are eligible for re-election, and offer themselves accordingly. The Auditor who goes out of office by rotation is Montagu Somes Pilcher, Esq., who is eligible for re-election, and offers himself accordingly.

The CHAIRMAN, in moving the adoption of the report, said he was called upon to perform one of the most difficult duties which the confidence of his colleagues had thrown upon him by placing him in the chair. His task was doubly difficult, in consequence of his predecessor in office possessing a command of language—he might say of languages—which at once conveyed to the proprietors a sense of his mastery over the affairs of the Association, while so far as he himself was concerned, he could only hope to interest them by the nature of the facts which he brought to their notice, and not by the language in which he presented those facts. On the last sad occasion of their meeting, many must have thought with him that Sir Julian Goldsmid, whose strong spirit dragged him into the room to resign to them the trust which the proprietors had reposed in him, and to deliver to them his valedictory address, was not in a condition to hear—and he was sure it would have been very much against their deceased Chairman's taste to have heard—any commendation passed on the brilliant period of his rule. That day, however, it might not be inappropriate for him to tell the tale; and he alone survived on the Directors' side of the table to do so, having been elected to office just 33 years ago to serve a short apprenticeship as Auditor with his friend Mr. Sebag Montefiore, who still continued conscientiously to fill that office. On Tuesday, May 2, just 70 years ago, the first general meeting of the proprietors was held; so that 30 years became a kind of half-way house in the history of the Association as a practical undertaking. During the

greater part of the last 30 years, Sir Julian Goldsmid certainly held a predominant position in controlling the affairs of the Association; and it therefore became appropriate to consider their deceased colleague's services in connection with the history of that period. Sir Julian was pre-eminently a man of affairs; and where he did not immediately direct those affairs, he certainly controlled them. Thirty years ago there were only 895 proprietors in the Association; whereas there were now 5293. Of course, this increase was not due to Sir Julian Goldsmid; but it was largely owing to the policy developed in the period in question. In 1865, the dividends paid amounted to £196,000; and last year the amount was £456,000. At the former period, the contracts with Municipalities numbered less than 20, whereas they were now more than 100; and in this matter, they were very directly indebted to their late Chairman. In looking at the history and progress of a gas undertaking, the engineers' standpoint was the quantity of coal carbonized. In 1865 they used 315,000 tons, as compared with 864,000 tons last year. In the same interval, the public lighting consumption had grown from 485 to 1189 million cubic feet—an increase of 145 per cent. In private lighting, the figures were respectively 1975 and 7262 million cubic feet—an increase of 267 per cent. They then came to the question of waste and leakage, which many considered a great test of what a gas company was doing in its economies. The waste and leakage in 1865 amounted to 480 million feet, whereas it was now only 372 million feet; being absolutely less now than it was in the earlier period by 21·25 per cent. The quantity of gas produced was 2967 million feet in 1865, compared with 8939 million feet last year, or an increase of 201 per cent. He thought from these facts they might infer the value to the Association of Sir Julian Goldsmid's services. With regard to the report which had been read to them, there was very little to remark. Comparing the half year under review with the corresponding period of the previous year, the gas made had increased 2½ per cent.; the number of lights was 5 per cent. more; and there was an increase in the consumers of 10·57 per cent. In other words, the percentage of increase in the consumers was double that of the number of lights, and four times that of the gas made. This was certainly not owing, as many might suppose, to a great increase in the number of penny-in-the-slot meters; and he hoped that this was something still to come for the benefit of the Association. They were in this matter ahead of the public authorities in some countries abroad; but being in front of public authorities was no new thing in the experience of their Association. The report stated that "the use of the incandescent gas-burner. . . . has to some extent affected the increase in the consumption of gas; but the Directors have reason to think the Association will ultimately benefit by this improved system of lighting." He distinctly felt—and was prepared to act on this policy—that nothing which reduced the cost of gas to the consumer, other things being equal, could ultimately do anything but benefit the producer of gas. There was the ordinary see-saw in the receipts from residuals, one of which was sometimes better while another was worse. On the present occasion, it was the ammoniacal liquor which showed a decrease. The cost of coal had increased a fraction of a penny. This was all he wished to say upon the report, which dealt with the half year to Dec. 31 last; and in the course of the present six months—which they expected their Chairman to refer to if anything occurred substantially to affect their affairs—there was equally little to say, or that could be said with any advantage to the interests of the Association. In it they had had the retirement of Mr. Thompson, their late Secretary, who served them in various offices for 33 years; and one was very sorry that ill-health should have necessitated this step being taken. They had appointed in his place Mr. Wilson, who had been Assistant-Secretary for the last year and a half, and who had also been on the staff for a very considerable period; having entered their service straight from school. Being now in the vigour of intellectual manhood, he hoped Mr. Wilson would serve them faithfully for many years to come. He should hardly have referred, even to the extent he had done, to the history of the Association, were it not that he believed there were lessons which they could draw from it for their guidance in the future. Unless history were read in that light, it was of very little use to anyone. In the last 30 years they had seen, with God's blessing, wonderful prosperity; and might it continue! He desired, however, to point out the principles which he believed had enabled their prosperity to be attained in the past. He knew there were some who said that the Association had passed its grand climacteric; but he maintained that if they followed in the footsteps of their past history, what had been attained might be retained. In their original prospectus, which was a very curious document, he read this sentence: "It is evident that such an enterprise combines the twofold object of benefiting our neighbours and ourselves; for while it extends the employment of British capital, it confers increased happiness and comfort on the inhabitants of the Continent." They had attained a success which had been built up by the following out of genuine commercial and wholly moral principles. They had considered the interests of their consumers in every way that they could do so consistently with the interests of the proprietors.

Mr. J. HORSLEY PALMER (the Deputy-Chairman) seconded the motion.

Mr. SNOWDEN said he gathered from the report which had been read that about £230,000 was available for dividend and bonus.

The CHAIRMAN: £228,000.

Mr. SNOWDEN said that the question he desired to ask was how much would be absorbed by the proposed distribution.

The CHAIRMAN: Exactly that amount.

The motion was then put and carried unanimously.

The CHAIRMAN next proposed that a dividend of 5 per cent. for the half year ended Dec. 31 last, with a bonus of 1 per cent., be declared upon the £3,800,000 stock of the Association, payable free of income-tax, on and after the 12th inst. The payment of the dividend, he said, would be made at least a fortnight earlier than usual. They were trying to assimilate the practice of the Association to that of other public companies; and he believed that this would be greatly to the convenience of those who happened to be transferring or acquiring interests in the concern.

Mr. PALMER seconded the motion; observing that it would be a great convenience to the officers, and would also facilitate the quicker distribution of the dividends, if every stockholder who had not done so would give to the office an order to have the dividends paid direct to his banker instead of to himself.

The motion was carried unanimously.

Resolutions were afterwards passed re-electing the retiring Directors and Auditor.

On the motion of the CHAIRMAN, seconded by Mr. PALMER, a cordial vote of thanks was passed to the staff in London and on the Continent; and a similar compliment to the Chairman and Directors brought the meeting to a close.

CHESTERFIELD WATER AND GAS COMPANY.

The Allocation of the Purchase-Money.

The Adjourned Meeting of the shareholders in the above Company was held last Tuesday—Mr. R. T. GRATTON presiding—to further consider the scheme of the Directors for the allocation of the £231,836 paid by the new Gas and Water Board for the property of the Company. The scheme was set forth in the "JOURNAL" for the 28th ult.

The CHAIRMAN said he was pleased to announce that the gentlemen who at the previous meeting raised objections to the proposed mode of allocation, had, as the result of a fortnight's consideration, and in one case the advice of eminent Counsel, withdrawn their opposition to the scheme. Therefore he ventured to hope that it would now receive the unanimous approval of the shareholders. The motion he had to propose was—"That the scheme relative to the distribution of the purchase-money, amounting to £231,836, received from the Chesterfield Gas and Water Board, and of any balance of the capital funds of the Company, and a copy of which has been sent to each shareholder and stockholder, as required by the Chesterfield Gas and Water Board Act, be and the same is approved."

Mr. S. BURKITT seconded the motion; and it was at once unanimously carried.

The CHAIRMAN congratulated the shareholders on having seen their true interests. They had arrived at a point which saved them no end of trouble and risk, and a certain amount of costs. Mr. Stanton (the Company's Solicitor) and himself, and the Board generally, would do all that they could to effect a speedy distribution of the funds in the way indicated by the scheme; but if the shareholders did not receive their money in a few days, he hoped they would have a little consideration, and remember, as he had said before, that they were navigating unknown seas. They did not know what risks they would have to encounter; but he could assure them that no effort would be wanting in order to put them in possession of the moneys they had invested in the concern and the premiums indicated in the scheme. They had achieved a wonderful result that day, for they had succeeded in convincing 350 people; and the scheme as a whole no doubt met with their approbation.

Mr. F. STACEY expressed his satisfaction at the withdrawal of all opposition—a course which he felt sure all would appreciate, seeing that the objectors were men of sufficient firmness, ability, and means to have carried the matter on, and entailed the expenditure of a considerable sum of money. He proposed a vote of thanks to Mr. Gratton for his services as Chairman; and, in doing so, he referred to the energy that gentleman had expended in meeting the troubles and difficulties incidental to the crisis the Company had passed through.

Mr. J. LINGARD seconded the motion, which was carried.

The CHAIRMAN, in returning thanks for the vote, assured the shareholders that any exertions he had made on their behalf had been very ably seconded by the Directors and Mr. Stanton. Those who had so ably assisted them had been the gentlemen who composed the office staff; but for their help, the difficulties would have been enhanced, and the result might not have been so satisfactory as it was. In the Water Trust Bill under which the various London Water Companies would have to sell their concerns, a clause was inserted that arbitration should take place under the Lands Clauses Consolidation Act, 1845. This clause was inserted in the Chesterfield Act; and, in effect, they might claim that London had copied Chesterfield in this respect. Looking at the result of the arbitration as a thing that was past and gone, he felt very thankful—and he thought they all did—that they were in the position they then occupied. They were relieved of a tremendous responsibility in connection with the future water supply of Chesterfield. The supply at present was all that could be desired. But, as Mr. Jones, the Engineer and Manager for the new Board, would bear him out, the water that was available for the next five months—up to next October—was a matter of very serious moment indeed. Mr. Jones and his Board had to contend with these anxieties; the Directors of the Company had not. They had done with them for ever. But he could say, having had a large experience in connection with the water supply of Chesterfield, that the consumers ought to extend to the new Board, and particularly to Mr. Jones, who was responsible primarily for everything that took place in connection with the water supply, all the leniency and consideration possible. He concluded by thanking the shareholders for the very courteous manner in which they had treated him during his long connection with the Company—a connection which had lasted for 28 years. He knew that the various members of the Board had all been actuated by a strong sense of duty, not merely to the shareholders, but to the public at large.

The meeting then terminated.

The Liverpool Corporation and the Gas Company.—The Lord Mayor of Liverpool (the Earl of Derby) has been requested by the Lighting Committee to call a special meeting of the Council to consider a recommendation they have to make upon the subject of the gas supply of the city.

Proposed Purchase of the Wells Gas-Works by the Corporation.—The Local Government Board have refused to sanction a loan to the Wells Town Council for the purchase of the gas-works. A proposal has now been made that the Council should promote a Bill in Parliament for the purpose; and the matter is to be discussed at a specially convened meeting.

THE GAS, ELECTRIC, AND HYDRAULIC SUPPLIES OF MANCHESTER.

At the Meeting of the Manchester City Council last Wednesday—the Lord Mayor (Alderman A. E. Lloyd) presiding—Alderman Gibson moved the adoption of the recommendation of the Gas Committee, that application be made to the Local Government Board for sanction to the borrowing of £250,000 for the purposes of the gas-works. He said, although they wished for authority to borrow this sum, it was not the intention of the Gas Committee to spend £250,000. Members would remember that some time ago they obtained power to borrow £500,000. Half of this sum had been spent very profitably; and the Committee required power to borrow the remainder to have ready for use should occasion arise. Alderman Higginbottom seconded the motion; and it was adopted. Alderman Gibson then proposed a similar resolution in regard to the borrowing of £100,000 for the purpose of extending the electric-lighting plant, mains, and services. He said he had no doubt that the Committee would require this money, and would spend it advantageously. It would be chiefly laid out on mains for the extended area which they had power to light with electricity. Alderman Higginbottom seconded the proposition; and it was adopted.

On a report being presented by the Water Committee, Mr. Royse suggested that it would be wise to keep the accounts of the hydraulic supply separate from those of the water supply, in order to clearly show whether or not the hydraulic department was a paying concern. Alderman Sir Bosdin T. Leech said that, while the expenditure on the hydraulic department had been £1000 more in 1895-96 than it was in 1894-95, the receipts had increased during the same period by £4325—from £3242 to £7567. There was no loss now on the hydraulic department. It was covering all expenses, including cost of water and interest, and was therefore on capital ground. The system of separate accounts would be considered; and, if found desirable, it would be adopted. Sir Bosdin afterwards moved the adoption of a domestic water-rate of 9d. in the pound, and a public water-rate of 3d. in the pound for the year ending March 31, 1897. He said the Committee were now paying the whole of the interest and the sinking fund on the Thirlmere water supply. They had not caused any increase in the rates; but they had, on the other hand, made reductions in the charges for baths, and also a reduction in the incidence as between the rateable gross and net value of property. The report was adopted.

LEEDS CORPORATION GAS SUPPLY.

The Gas Profits and the Rates—The Salary of the General Superintendent.

At the Meeting of the Leeds County Council last Wednesday—the Mayor (the Right Hon. W. L. Jackson, M.P.) presiding—there was a protracted discussion on the question of transferring a sum of £18,000 to the city fund for the purpose of wiping out a portion of the accumulated deficiency on the rates of past years. The Council also considered the proposal to increase the salary of the General Superintendent of the Gas Department.

Mr. John Gordon, in moving that a city rate of 2s. 2d. in the pound be levied, referred to the accumulated deficit, which, he said, amounted to £49,636, in addition to the estimated probable deficit of £8164 on the current year. In considering how best to deal with this, the Finance Committee came to the conclusion that, seeing last year had been a fairly successful one for the Gas Committee, the best thing was to ask them to contribute £18,000, which would cover the estimated deficit on the year, and leave £10,000 towards the liquidation of the accumulated deficiency of £49,636. Some members might think this was an improper way of dealing with the Gas Committee's surplus; but with a view, if possible, of shortening the discussion, he did not propose to deal with the case either *pro* or *con*. He had to confess quite frankly that he believed it would be fairly easy for any man to get up a decent case either way. The thing that had weighed with him, and, he believed, with the Committee generally, was that the motion up or down of the rates ought to be as slight as possible; and, in his opinion, it would be more convenient for the ratepayers if, instead of raising the rates, they were to accept the grant which the Gas Committee were prepared to make to them.

Alderman Cooke seconded the resolution.

Mr. Henry contended that the rates ought to be levied in sufficient amount to enable them to pay their way. They had followed a wrong principle in allowing arrears to accumulate. For the coming year Mr. Gordon was not asking for a sufficient rate to cover the expenditure; and he was relying upon grants from some other sources to meet it, which was not proper financing. They should, at all events, increase the rate by that amount; and he would be very glad if they would also increase it by another penny for the purpose of reducing the accumulated deficiency. Mr. Gordon did not propose to do this, but relied on £18,000, which was not to come out of the pockets of the ratepayers, but from the gas consumers, who were a distinct body from the ratepayers. Who, after all, would pay this rate which ought to be levied, but which was not going to be levied? He ventured to say it was the small consumers of gas. There were hundreds of ratepayers who were using electric light. Their duties as ratepayers were not decreased by that fact; and their rates ought to be raised to a sufficient amount to meet the requirements of the city. People who were actually purchasing light from a rival source were going to be relieved, if the resolution was carried, to the extent of a threepenny rate; and the small gas consumers were going to be taxed to the extent of 2d. per 1000 cubic feet for their benefit. He then moved that the question be referred back to the Finance Committee for further consideration, and that they be authorized to levy a sufficient rate to cover the expenditure for the coming year, and to gradually wipe out the accumulated deficits.

Mr. Pickersgill seconded the amendment.

Mr. Willey remarked that the last speaker objected to the gas consumer being taxed for the benefit of the general body of ratepayers; and he also said that gas consumers were a quite distinct body of ratepayers. But the larger gas consumers were also the larger ratepayers; and he regarded Mr. Henry's assertion as entirely misleading. Mr. Gordon was quite right in refraining from increasing the rates so long as it could possibly be avoided. When the rates reached a certain figure, it was a very difficult matter to get them back again. A very great burden was thus inflicted on tradespeople; and the Committee had acted wisely in using the surplus of the Gas Committee instead of increasing the rates. At Birmingham they always disposed of the gas profits in this manner.

Alderman Harland did not agree with the view which Mr. Henry took as to the appropriation of the gas profits. The gas undertaking was the property of the ratepayers; and the ratepayers were responsible for any loss that might accrue under that head. He knew instances where the ratepayers had been asked to contribute towards liquidating the losses of the Gas Committee. [Mr. Henry: "Never."] He thought Mr. Derry, their Accountant, would know better than Mr. Henry as to that. That they had received money previously out of the gas profits, he admitted; but it was the positive duty of the Gas Committee to pay their profits into the borough fund. The rates would be about 7s. in the pound, because it was expected that the poor rate would go up 2d.; and he put it to members whether it was more expedient, and more to the convenience and advantage of ratepayers, that there should be an increase in the rates, or that there should be the proposed contribution of £18,000, which would leave the Gas Committee £10,000 to pay to the reserve fund, and keep the rates as they were?

Mr. Wilson held that, as the Corporation were responsible for any loss in connection with the Gas Department, they were justified in taking the profits of the department. He also referred to what he regarded as the superior management of the gas-works since Mr. Tweedale became Chairman of the Committee.

Alderman Baker submitted that the so-called superior management of the gas-works since Mr. Tweedale became Chairman was to be largely ascribed to the comparatively low price of coal during this period.

Mr. J. Bowling said there was no reason why they should be grateful to the Finance Committee; for their proposal, if carried out, would simply enable them to shuffle out of their liabilities. The profits from the gas-works belonged to the consumers, who ought to have the benefit of them. It was proposed to take from the poor and give to the rich; and he would not be a party to such a policy.

Alderman Sir E. Gaunt held that the taking of the profits of the Gas Department in aid of the rates could not be defended on moral grounds.

Mr. Leuty, M.P., protested against the assertion that the Gas Department was now managed in a superior manner; submitting that the great bulk of the profits was to be ascribed to the low price of coal. Certain abuses which formerly existed had been pointed to by those who claimed credit for the present management; but it was absurd to think that these paltry irregularities made either for success or failure. He held it was unsound policy to bolster up one department by the aid of another. The same people were not concerned; and it must not be forgotten that it was unjust to trades that depended so much on gas to charge an excessive price for it. Instead of giving up their profits, the Gas Committee ought to have a reserve of not less than £50,000. If the Council put a penny on the rates, and allowed the accounts of the several departments to work themselves right, each bearing its own burden, they would adopt a much wiser policy than that proposed.

Mr. Lowden, the Chairman of the Gas Committee, in defence of the policy to which the previous speaker objected, said that last year the Gas Department wiped off a deficit of £32,000. This year they offered £10,000 towards reducing the city fund debt, and an additional £8000 in order that an increase of the rates might be obviated. Then he claimed that consideration had been shown to the gas consumers. Relief was afforded them to the extent of £11,000 by the abolition of the meter-rents, and to the extent of £19,000 by the reduction in the price of gas. This made £30,000 as compared with the figures for the year before last. As to the management of the works, he would allow the results to speak for themselves. With regard to the advantage obtained from the reduction in the price of coal, it was only fair to remember that the amount received from residuals for the six months ending December last was over £5000 less than during the corresponding six months of the previous year. The figures he had mentioned showed that the gas consumers had received generous consideration; and it was only reasonable that consideration should be shown to the ratepayers. The works were purchased and carried on with money secured by the rates; and if there was any deficit, the ratepayers would have to make it good. It had been stated that in some other towns money had been contributed by the gas-works to the corporate funds; but there was another precedent for the course proposed. Previous to 1877, large sums were paid by the gas undertaking into the borough fund; but in 1883-4 the sum of £10,000 was paid out of the borough fund for the relief of the gas undertaking. While supporting the resolution, however, he warned the Council that they must not expect to obtain relief annually from the department.

Alderman Hepworth observed that no great ability was required to carry on the concern with gas at 2s. 4d. per 1000 feet, seeing that it had been successfully conducted with the price at 1s. 10d. Then he questioned the policy which charged gas consumers something like £30,000 more than they ought to have paid.

The amendment was rejected; and the resolution carried by 39 votes to 13.

Mr. Lowden subsequently moved that the £18,000 of the profits derived from the gas undertaking be paid into the city fund.

The motion having been seconded,

Mr. Henry maintained that the profits had been derived not, as was claimed by some of Mr. Lowden's colleagues, from what they called the present superior management of the gas-works, but from altered circumstances. He recalled the fact that under Alderman Gilston's chairmanship, the price of gas was raised 4d., and that this brought in £36,000. Then by resolution of the Council the quality of the gas was reduced from 19 to 18 candles, by which a saving of from £18,000 to £20,000 a year became practicable. Further, through the fall in

the price of coal, the cost of production had been decreased by £12,000. These three items improved the financial position of the gas undertaking to the extent of £68,000. On the other hand, the wages of the men had been increased to the extent of £14,000; and the abolition of meter-rents involved a reduction of income amounting to £9000—making a total of £25,000. The difference between £68,000 and £25,000 was £43,000; and he asserted that no part of this balance was to be ascribed to management, but to altered conditions, brought about by resolutions of the Council, and by the fall in the price of coal. This being so, where, he asked, was the ground for asserting that the improved financial position was attributable to the "new era?"

The motion was adopted.

On the presentation of the minutes of the Gas Committee,

Mr. CONNELLAN objected to the action of the Gas Committee in not making better provision for the use of automatic gas-meters by the poorer ratepayers. He contended that the charge of 3s. was a preventive one. In regard also to the letting of certain work by tender, he was strongly of opinion that the Committee should carry it out under their own supervision.

The minutes were adopted.

Mr. LOWDEN next proposed that the Council increase the salary of Mr. R. H. Townsley, the General Superintendent of the Gas Department, from £300 to £500 per annum, and said the work had increased considerably during the past few years. In 1889, they carbonized 200,000 tons of coal; in 1894, 242,000 tons; and last year, 270,000 tons. Mr. Townsley had been for many years in the service of the Corporation; and as Manager of the York Street works, he gave thorough satisfaction. Prior to his engagement as General Superintendent, they had employed the late Mr. Lupton at a salary of £400 a year, two managers at £300, and one at £250; making a total of £1250. At present Mr. Townsley, in addition to his duties as General Superintendent, discharged those connected with the management of the York Street works; and thus a great saving was effected. He had done much to bring the works to their present state of efficiency. Compared with such towns as Nottingham, Manchester, and Bolton, the salary proposed to be paid in Leeds was not large.

Mr. WILLEY seconded the motion, and stated that in Leicester a salary of £1250 was paid to the Gas Engineer, though only 110,000 tons of coal were carbonized.

Mr. HEALD, as Chairman of the York Street works, bore testimony to Mr. Townsley's ability in the discharge of his duties.

Mr. BATLEY was also glad to see Mr. Townsley so successful; he being one who had risen from the ranks.

Mr. HENRY was of opinion that, if Mr. Townsley was to be regarded as Gas Engineer to the Corporation, the fact should be distinctly stated; but it seemed as if that title had been arrived at by a process of evolution. For a Gas Engineer to a city like Leeds, a salary of £500 was not sufficient.

The motion was unanimously agreed to.

ROTHERHAM CORPORATION GAS UNDERTAKING.

Annual Statement.

At the Quarterly Meeting of the Rotherham Town Council last Wednesday,

Mr. GUMMER made a detailed statement as to the operations of the Gas Department during the past year. He thought it was a matter for congratulation that the working had been so satisfactory as to realize a handsome profit, which would to some extent go towards the relief of the rates. The demand for gas had reached 160 million cubic feet, compared with 153 millions the previous year; showing an increased consumption of 6,226,000 feet. Considering the mild winter and freedom from fog, he thought the increase was very satisfactory. The gas made had been 174,046,000 cubic feet, as against 169,098,000 feet in the preceding year. The unaccounted-for gas amounted to 7·56 per cent., as compared with 8·64 per cent. There were 49 miles of mains running through districts where there was a great amount of leakage, and many of them where there were no services connected. He attributed the increased consumption of gas to the adoption of automatic meters. In the first year there were 187 fixed, and last year 1450; making a total of 1602. The Manager anticipated that, by the end of the present month, 2000 of these meters would be in use. With the growing demand, there would be, towards the end of the year, a still further increase in the consumption of gas. In the course of the year, they had carbonized 16,631 tons of coal, or 101 tons less than in the previous year; and it reflected the highest credit on the officials that they had produced 6,226,000 cubic feet more gas. It also showed that the coal they received was of good quality, and the gas-works plant in a thorough state of repair. For every ton of coal carbonized, they had produced 10,406 cubic feet of gas, as against 10,106 feet in the previous year. Dealing with the revenue account, it showed a profit of £9201 (an increase of £1000 over last year), which was equal to 8 per cent. on the capital expenditure. Loans and sinking fund had absorbed £4095; leaving a net profit of £5105. Out of this the Highway Committee took for public lighting £2162; and the Finance Committee proposed to set aside £1106 for the contingency fund of the Gas Department, and to place £532 to the credit of the district fund—the latter sum being equal to a reduction of a penny in the pound on the rates. With regard to the residuals, coke last year realized £3623, as compared with £4008 in the previous year; tar £1317, as against £1236; and ammoniacal liquor £934, as against £1301. They had, therefore, a decreased revenue from residuals of £671 in comparison with the previous year. They had also to incur last year an additional expense of £447 in getting the residual products into the markets. The two together amounted to £1100, which, under ordinary circumstances, might have been added to the profit earned. He next spoke of the increase of rates; the department having had to pay last year £201 extra. In the coming year, they would have seriously to consider the desirability of extending the gas-works. Next winter it was anticipated that the consumption would go up to 200 million cubic feet; and the Manager had informed them that he could not be responsible for next winter with his present plant. Already this year the increase was 60,000 cubic feet.

Alderman NEILL complimented the Chairman of the Committee on his statement, and seconded the motion.

Mr. HIRST criticized the management of the gas-works, and especially alluded to the complaints made by consumers that they had heavier gas bills to pay. He also denied that everybody was satisfied with the quality of the gas.

The proceedings of the Committee were adopted.

LINCOLN CORPORATION GAS AND WATER UNDERTAKINGS.

A Profitable Year in the Gas Department—Reduction in Price.

At the Monthly Meeting of the Lincoln City Council last Tuesday—the MAYOR (Mr. E. Harrison) presiding—the Chairmen of the Gas and Water Committees laid before their colleagues the general results of the operations of their departments during the past financial year.

Alderman PAGE, in proposing that the minutes of the Gas Committee be adopted, stated that, subject to audit, the annual accounts of the department had been completed. The members were aware that the Committee had not added to the capital account from the time of the purchase of the works ten years ago—capital expenditure during that time having always been paid out of revenue; and consequently, though the undertaking was of much greater value, the capital remained the same. The year ending March, 1895, was a good one; and he was happy to say the accounts up to March 25 last showed another good year. The quantity of coal carbonized was not quite so much as the amount consumed the year before, partly owing to the mildness of the season, and a smaller demand from the foundries. But science was always advancing; and their Manager (Mr. J. Carter) had been able to squeeze more gas out of a less quantity of coal. The amount carbonized was 22,961 tons, as against 23,071 tons; and 242 million cubic feet of gas were produced, against 237 millions in 1894-5. He might say also that the leakage had been less. Notwithstanding occasional grumblings as to the quality of the gas, curiously enough the number of consumers was constantly increasing; and there were now 300 more than a year ago. The net profit, after discharging interest upon the stock and sinking fund, and allowing for depreciation (altogether amounting to £8200), was £3752; against £2948 in the previous year—an increase of £804, notwithstanding that the amount received from meter-rents was £300, against £607 the year previous. With regard to the £3752, they had spent £1060 on what was strictly capital account—viz., the provision of sulphate of ammonia plant. They were thus left with a net sum of £2692 to be dealt with as the Corporation might think fit. In addition to the past year having been a good one, so far as price of coals was concerned, they believed the present one would be equally fortunate. Wisely or unwisely, they had bought the whole of the coal required for the ensuing year at the current low prices. As to the manner of dealing with the £2692, it was considered that hitherto the consumer had received the whole of the profits arising from the sale of gas, subject, of course, to this—that by the operation of the sinking fund, the gas concern would eventually be the property of the ratepayers. The Committee felt that, on this occasion, they might fairly divide the profits, and not give consumers all of them. They were very grateful to the consumers; but it must be remembered that the ratepayers had the burden and risk of the undertaking—something like £200,000—spread over a period of 40 years to come. It was not unfair, then, that the profits should be reasonably distributed between the consumers and the ratepayers. The Committee proposed that the price of gas as and from September next should be 2s. 3d., instead of 2s. 4d., which would absorb about £800. They found then they could spare in aid of the general district rate a sum of £1500, which was not much less than equal to 3d. in the pound on the existing rate.

After a short discussion, the proposition was adopted.

Alderman MALTBY, in presenting the minutes of the Water Committee, referred to their annual accounts. He said they had spent £620 on capital out of revenue, and had a balance of £395 on the year. When they took into consideration that the time was fast approaching when they must look out for a larger supply of water, the Committee were anxious to husband their resources, and not come upon the Corporation to assist them. They desired to reserve capital for this particular purpose. From one time to another, they had handed over to the rates something like £500 or £600, in addition to paying off £2000 borrowed, which was very speedily done, and for which the £500 would be good interest. They had now a property worth £100,000, which had paid its way, put by a certain amount for sinking fund, and not cost the city a penny. He hoped they would soon be in an even better position. When they purchased the undertaking, they had to pay 4½ per cent. for the money borrowed from the Bank of England. This money had to be kept for thirty years; and the Bank refused to let them pay it in. But in five or six years' time, they would be able to do so, and re-borrow the money—£50,000 or £60,000—at 3 per cent.

The minutes were approved.

The Newport (Mon.) Water-Works Scheme.—In accordance with the resolution of the Water Committee of the Newport (Mon.) Corporation, the reports of Messrs. Hill, Hawksley, Tiddeman, Etheridge, Baldwin Latham, Kirby, and Currie, upon the suitability of the site at Wentwood as a reservoir have been issued. It may be remembered that, towards the close of last year, it was decided to terminate the contract with Mr. J. Young, of Glasgow, owing to adverse reports concerning the site. The balance-sheet now issued with the experts' reports shows: Estimate of work to be done, £95,021; paid to contractors and others, £62,174; paid for land, £8570; engineers' commission, £1800—total, £167,565. The chief interest attaches to two reports by Mr. Baldwin Latham, dated Feb. 10 and March 31 last. In the first, he expresses the opinion that the reservoir can be made as water-tight as most reservoirs of the kind usually are; and in the second, he strongly advises the Committee to proceed at once with the completion of the work. At a recent special meeting of the Town Council, the subject was very warmly discussed; the result being that the Committee's recommendation to follow the advice of Mr. Baldwin Latham was adopted with two dissentients.

WIGAN CORPORATION GAS SUPPLY.

Annual Report.

At the Monthly Meeting of the Wigan County Borough Council last Wednesday—the MAYOR (Mr. Alderman Layland) presiding—the Chairman of the Gas and Electricity Committee made his annual financial statement.

Alderman HOLMES, referring first to the net profit on the working of the gas undertaking during the past twelve months, said that it amounted to £9744. This was not so much as last year; but taken on the whole, and considering the reduction in the price of gas last year, by which £1650 was absorbed, he thought it might be taken all round as satisfactory. In conformity with the wishes of the Finance Committee, the Gas Committee had handed over £8750 in relief of the district rate, which left a balance from their profits of £996, which with a balance of £41 from last year, left a total available sum of £1035. The increase in the make of gas during the year was 7,304,000 cubic feet, or something like 2·34 per cent.; and the increase in the sale was 9,353,800 feet, or 3·16 per cent. These figures showed that there had been less condensation and less breakage of the mains. The number of consumers had increased by 270; making the total 7979. The population of the Wigan gas-supply district was 150,000; and if this number were divided by five (which would represent something like a household), it would give them 30,000 habitations as against 8000 consumers—thus revealing that very little more than a quarter of the inhabitants of the gas-supply district were burning gas. By the plant they now possessed, they were able to supply something like a third more gas than they had hitherto done; and this meant about 33 per cent. on their present consumption. As to the price of the coal and cannel carbonized, they had obtained a reduction of about 7d. per ton, or £600 in the aggregate; but this was absorbed by an increase in the sinking fund of a like amount. Residuals, particularly sulphate of ammonia and coke, had fallen in price. Sulphate, of which they produced annually over 300 tons, had dropped during the last two years from £13 15s. per ton to £7 15s.; representing a falling off of about £2000. Then rates and taxes had increased during the year by £227. The leakage had been reduced to 3·622 per cent.; while in 1888 it stood at 7·753 per cent. He believed that, when the works were taken over by the Corporation, the loss from leakage was about 20 per cent.; and that, he was sure they would agree with him, called for special commendation, and showed that a perfect oversight had been maintained as far as could be done. The make of gas per ton of coal and cannel carbonized during the year had risen again by nearly 100 cubic feet per ton. They had last year the highest record in the make of gas from the coal and cannel carbonized. Last year it stood at 11,524 cubic feet; and now, at 11,623 cubic feet. These figures must be equally satisfactory to the members of the Council as they were to the members of the Gas Committee. He had pleasure in calling attention to another pleasing fact in the minutes, and that was the reduction in the price of gas within the mile radius for illuminating purposes by 1d. per 1000 cubic feet—from 3s. 2d. to 3s. 1d. This was done in conformity with the course adopted some years ago. When at Christmas, 1893, the price of gas was raised 3d. all round, there was an understanding that it should be reduced at the earliest possible moment. The Council last year saw fit to reduce the price of gas outside the mile radius 3d. per 1000 cubic feet, and 1d. within. This time they had not gone beyond the mile radius, but kept inside it. This, he was sure, left no ground of complaint for those outside the mile radius, because 6d. per 1000 cubic feet was, he thought, established some years ago with the out-townships as being a fair and reasonable differential charge. He proposed the adoption of the Committee's minutes.

Mr. FYANS seconded the motion.

Mr. M'QUAID said the report of the Gas Engineer had only been in their hands a short time; and he wished to know whether they could refer to it at any later date. If not, he did not think it would be fair to allow it to go undiscussed that day.

Alderman HOLMES said, if it was the wish of the Council, he had no objection to the report being discussed at some other time.

It was understood that the report could be referred to at a future meeting; and the motion was passed.

BLACKPOOL CORPORATION GAS UNDERTAKING.

Expansion of Business.

The Blackpool Town Council had a most satisfactory report submitted to them by their Gas Engineer (Mr. John Chew) at their meeting last Tuesday—showing that, in face of the competition of the electric light, substantial progress was made during the year ending March 25 last. The report read as follows: "The capital during the past year has been raised from £100,873 to £102,864—an increase of £2000, all of which has been incurred for mains and meters—6244 yards of the former (chiefly 3-inch bore) bringing the total length of mains to 53¼ miles. The number of service-pipes has been increased by 740; making a total of 6950 now laid. The number of meters in use has been increased by 460. The number of street-lights (burners) has increased by 140; making the total street-lights 1540, 160 of which are in use all through the night, the others only half the night. The coal used has been 26,986 tons, making 279,982,000 cubic feet, or 10,370 cubic feet per ton, of 18·3-candle gas. The leakage has been 3,138,000 cubic feet, or equal to 1·2 per cent. on the make. The gas accounted for is 10,210 cubic feet per ton of coal. The quantity of gas sold to private consumers has been 258,734,000 cubic feet—an increase of 23¾ million cubic feet over last year. The public lamps have taken 16,809,000 cubic feet—an increase on the previous year of 1,589,000 cubic feet. At this rate of progress it will not be very long before the new gasholder will be required, at a cost of £15,000 or £20,000, to be fixed on the east side of the railway, permission for which was obtained from the Local Government Board some time ago. Coming to the revenue (expenditure) account, coals have been bought at a less price per ton than the previous year; making a very considerable difference in our favour. The other items of expenditure have been considerably increased by the increased make of gas and general wear and tear. Taking it altogether, the expenditure exceeds that of last year by over £200. Now taking the income side of the account, the receipts from private consumers for gas only (no meter-rents being charged) at 2s. 4d. per 1000 cubic feet is £30,172, against £27,452 last year—an increase of £2720. Street-lamps have brought £140 more than last year. Coke has not done as well as last year; for, although we have sold 1700 tons more, we have received less money for it by nearly £400. Sulphate of ammonia has been very bad to sell, except at a very low price (the lowest point touched for 20 years or more); and there is no appearance of improvement. Our receipts in cash are £1000 less than the previous year, and both gas liquor and sulphate are a complete drug in the market. Tar and sundries have done better by about £500 than last year. Summarizing the whole income, the amount is £42,897, exceeding last year by £2000; and the gross profit is a little over £12,000, or about £1700 more than the previous year. Out of this will have to be taken about £5600 for interest, sinking fund, and renewal fund; leaving as near as possible £6400 at the disposal of the Corporation, which is much in excess of the estimate at the beginning of the year." Mr. Pagnam, in moving the adoption of the report, said he thought it would be satisfactory to the members to see how handsomely the gas undertaking had worked in the past year. They were £1400 above the estimate; and he hoped they would continue in the future as in the past. Alderman Buckley inquired how much profit had been derived from the lowering of the price of coal and cannel. He did not like people to take credit for something they had no control over. If they had had a saving in coal and other goods of £2000, it meant £300 to the debit side. Mr. Pagnam said the profit arose through good management—it was owing to purchasing coal at a less price than they estimated. Any further particulars Alderman Buckley wanted, he might have by interviewing the Gas Manager.

STOCKPORT CORPORATION AND GAS AND ELECTRIC LIGHTING.

Proposed Water-Gas Plant.

At the Meeting of the Stockport Town Council last Wednesday, Alderman Lees proposed that they ask the permission of the Local Government Board to the borrowing of £43,000 for the purpose of gas-works extension. Mr. Burrows, in seconding the motion, pointed out that, under their old Improvement Acts, the Council could have raised the money by their own stock. This was the first time the Corporation had had to go cap in hand to the Local Government Board asking permission to borrow money for the gas-works. Dr. Marriott remarked that in committee he had supported the idea of instituting water-gas plant, for which some £7600 was to be borrowed. There was certainly some addition required to the present supply of gas in the town. This was necessitated by the increase in the population, which, since the census of 1891, had gone up about 5000. If a thick fog occurred, or there was a breakdown in the producing plant at the works, some further supply would be needed. One of the great advantages of carburetted water gas was that a good supply could be obtained at very short notice. It was not intended to distribute this gas alone; but it was to be mixed with the coal gas in the proportion of 10 to 25 per cent. The effect of this would be that the gas of the town would contain only 7 per cent. of carbonic oxide. Mr. Webb pointed out that one of the chief advantages was that the plant to produce the water gas could be laid down at about half the price that it would cost to construct plant to produce the same amount of coal gas. The production of water gas would lessen their consumption of coal by about 18,000 tons; and this would mean a similar reduction in the production of coke. The resolution was carried. On the Gas Committee's minutes, Alderman Atherton asked if it was the intention of the Gas Committee to take into consideration the question of supplying the electric light. The Chairman of the Committee (Mr. Webb) said they had discussed the matter; but they had not arrived at a scheme that could be made successful in Stockport. However, the Committee meant to make some sort of move shortly, and to find out what demand there would be for the light. They, however, did not wish to go into anything that would not pay; and they would, he was sure, not bring any scheme before the Council till they thought it had some prospect of being a success. The minutes were carried.

THE DISPUTE AT THE WEST BROMWICH GAS-WORKS.

At the Meeting of the West Bromwich Town Council on Wednesday—the Mayor (Mr. G. Salter) presiding—Alderman R. Farley, the Chairman of the Gas Committee, referred to the trouble which had arisen at the gas-works, as mentioned in the "JOURNAL" last week, and said he felt it right to make a few observations respecting the matter. There had been a dispute with the men; but he complained that, while negotiations were going on, a one-sided statement and hostile criticisms had appeared in a local paper. He explained that recently the regenerative furnace system as well as mechanical stoking had been introduced. Three sets of men, instead of two sets as before, had been put on for the 24 hours. This increase in the number of men cost the Committee upwards of £1000; in other words, the profits of the ratepayers from the gas undertaking were reduced by £1000 per annum. He agreed with the alteration. On the 3rd of December last year, the new system of firing came into operation; and as the men were inexperienced, the Manager (Mr. T. Glover) fixed the "stint" at 32 mouthpieces to draw and charge, as the coke was to be turned out in the same way. Statements for the purpose of comparison were obtained by the Manager from seven other towns; and it was then discovered that the cost per ton for charging, drawing, and coke wheeling was higher at West Bromwich than at any of the other places. As an alteration was subsequently made, and the operatives were required to

do extra work, a dispute ensued; but he was pleased to say that the men who had threatened to strike had come to a better frame of mind, and had commenced work under the new conditions. The men agreed with the terms offered by the Committee, with the exception of the quenching of the coke and the carrying of water. This compromise the Committee decided to accept; and thus settle the dispute. At a meeting of the West Bromwich Trades Council on the same night, Mr. H. Simpson, of the Gas Workers' Union, referred to the matter, and denied that the dispute had been settled amicably; and a resolution was passed condemning the action of the Gas Committee.

TOTNES AND BRIDGETOWN GAS COMPANY.

Leakage Caused by Traction-Engines.

At the Annual Meeting of the Totnes and Bridgetown Gas Company on Monday last week—Mr. G. Mitchell in the chair—the Directors reported an available balance of £676, and recommended the usual dividend of 12s. per share, carrying £76 forward. The Chairman, in moving the adoption of the report, mentioned that the amount to be taken to the next account was £9 more than last year. The motion was carried. The Chairman was one of the retiring Directors; and, in returning thanks upon his re-election, he referred to the difference between the quantity of gas produced and consumed, which was larger than usual. He said the Directors considered the traction-engine traffic cost them £80 last year in gas lost alone, in addition to a large sum for broken mains and services. This was a question which not only affected the Company, but also the Corporation and private individuals, for the number of drains broken was something extraordinary. They could account for the leakage in no other way—the percentage of loss having doubled; and they continually found broken mains and services in the line of the engine. Mr. Distin proposed a vote of thanks to the Manager (Mr. S. Samuel) for the great trouble he had taken in connection with the Company, more especially on account of the extra work caused by the traction-engine. Mr. Putt seconded the motion; and the Chairman supported it. He said Mr. Samuel was well worthy of a vote of thanks. He had had a lot of labour outside the works; and the discovering of leaks was very costly. Mr. Samuel, in reply, said he was greatly obliged for such an expression of satisfaction. The men and himself did all in their power to keep the works in proper order; but it was most discouraging to find the traction-engine traffic doing such damage. They had altogether nearly 500 service-pipes, mostly ¾ inch. The engine caused leakages which were not discovered for some time, and perhaps not at all. During the past year, the leakage was 6·574 per cent., or 907,700 cubic feet, against 3·180 per cent., or 384,400 cubic feet, in 1892; so that there was an increase of 523,300 cubic feet in the loss. This was roughly worth £80; and the extra cost of repairs, to his knowledge, after traction-engines had been £15. Apart from this, the incandescent light could not be adopted in the town, as the mantles were broken by the vibration. Mr. Distin said he had known new mantles put on in the morning, and broken by the traction engine by the evening.

THE BOLTON CORPORATION AND THE SALE OF GAS RESIDUALS.

The Alleged "Ring" of Tar Buyers.

At the Meeting of the Bolton Town Council last Wednesday, the question of the coal tar contract was again under consideration. It will be remembered that, at the last gathering of the Council (*ante*, p. 765), it was asserted by a number of aldermen and councillors that there was in existence a "ring" of tar buyers which was offering high prices so as to crush out the smaller firms, and so have the market to themselves. It was further alleged that the Bolton Gas Committee had let their contract to a firm who were members of the "ring;" and, upon a vote being taken, the matter was referred back for further consideration. The Committee, after inquiry, unanimously decided to re-affirm their previous resolution to let the contract to Messrs. Turner and Co. Alderman Miles, the Chairman of the Committee, in moving the confirmation of these proceedings, said it was not the best thing in the world to have bandied about the prices obtained for their products; and some harm was sure to come of it. He knew personally, from what he had seen in the technical papers, that it had done harm; and he could give three instances, but refrained from doing so. At the same time, some good had resulted from the discussion, because the Committee were in a position of knowing more than was the case when the contract was let. He must say, however, that he was not aware of a "ring" of tar buyers; but it had come to the Committee's knowledge that for the year ending March, 1895, there was an attempt made to form a "ring" for the purpose of manipulating the price of Bolton tar, and not in an upward direction. But he should add that Messrs. Turner were not the promulgators of that "ring." At the time, the price offered was 16s. But the figure obtained was 18s. 6d.; and the Council could form their own opinion from what he had said. This year the prices ranged from 22s. to 29s.; and he took it that it was their duty to accept the highest tender. The reason for such a high price being offered this year was because the competition was more fierce than he had known it since he became Chairman of the Gas Committee. Alderman Miles added that it was only fair to state, regarding Messrs. Turner and Co., that the Corporation had been selling them tar for ten years past; and he could say three things of them. During that time they had given a very full market value for the tar; there had not been a single moment's anxiety as to their willingness or capability to remove the tar as it was made (which was a very important thing); and there had also not been a single moment's anxiety as to the payment for the tar. Indeed, the money had come in so early that they had on a certain occasion to ask the firm to stop sending the cash. Altogether, the firm had done nothing to forfeit their confidence. He could exonerate them from participating in the "ring." Alderman Scowcroft and others expressed themselves satisfied at the result of the Committee's report; and the minutes were confirmed.

THE EXAMINATIONS IN GAS MANUFACTURE.

The Question Papers.

The examinations in "Gas Manufacture" were held by the City and Guilds of London Institute last Tuesday; the following being the questions put to candidates by the Examiner (Mr. Alfred Colson, M.Inst.C.E.):—

ORDINARY GRADE.

1. Describe the first process in the manufacture of coal gas. 2. Of what service is the condenser, and what points should be studied in its management? 3. Give a sketch of a hydraulic main with connections, and state why it is used. 4. In what way would you detect the chief impurities in gas? 5. What materials are employed, how, and for what purposes, in the purification of gas? 6. How is the pressure in street-mains controlled? 7. Describe the usual method of ascertaining the illuminating power of gas. 8. State what products result from gas manufacture, and give the quantity of each usually obtained per ton of coal carbonized. 9. Describe the general method of making joints in gas-mains. 10. Which is the more efficient, a batswing or an argand burner, and why?

HONOURS GRADE.

1. Describe a method of heating retorts by regenerator furnaces, and give a sketch of the arrangement you would adopt. 2. Give an outline sketch (cross section) and description of a stage retort-house. 3. How would you free gas from bisulphide of carbon? State the object of using air in connection with gas purification, and give reasons why it should be controlled. 4. How would you analyze producer and flue gases, and why should these be frequently tested? 5. Describe a method of enriching coal gas by means of oil. 6. Give sketches and description of a brick and puddle tank, 100 feet diameter and 20 feet deep, to receive an untrussed holder. 7. How would you make sulphate of ammonia from ammoniacal liquor? Give a sketch and description of the apparatus you would employ. 8. What advantages has stoking machinery over manual labour? Describe some form of such machinery. 9. Describe, and give sketches of, the apparatus you would employ for coal analysis. 10. Describe the principal gas-burners now in use, and state the merits of each.

The maximum number of marks obtainable was 30 for each question in both grades.

ELECTRIC LIGHTING NOTES.

Several references have been made in the "JOURNAL" to the scheme of electric lighting projected for Adelaide, South Australia. A poll of the citizens was taken on the matter; and they decided, by a large majority in each of the six wards of the city, not to have the light. The Corporation nevertheless arranged to have a so-called 2000-candle power lamp put at the intersection of certain streets. This would cost about £45 to erect; while the annual charge for the light would be £84—nearly seventeen times the amount paid per lamp per annum for gas. This little performance has had the effect of ousting some of the members from the Council. Electricians have lately written to the Corporation offering to erect more lamps; but the offers have been declined, as the South Australian Gas Company are showing the citizens what can be done with incandescent gas-burners. What the City will not have, the Port seems to be hankering after. A short time ago, the Corporation of Port Adelaide (which is distant about six miles from Adelaide, and has only 120 public lamps, the gas being supplied from separate works) wrote to the Australian Electric Light Company, asking them to fix a date upon which to sign the contract the Company had entered into to light the place with electricity. But a reply was received to the effect that the matter was under the consideration of the Board; and that the Company's Engineer had proceeded to England "in order to complete the necessary financial arrangements." It seems remarkably strange that such a journey should have to be undertaken for this purpose; but it points to the unwillingness, or possibly inability, of the residents, either at the Port or in the City, to find the "needful." A small syndicate which was started early last year with a capital of only £2000, in £20 shares, has difficulty in getting its shares taken up locally. So that electric lighting ventures at the Antipodes are not all flourishing.

The electric lighting system was established in Bristol in 1893. It may be in the recollection of readers that there were some initial difficulties in connection with the foundations of the buildings at the central station, and expense had to be faced in strengthening them. It was thought at the time that a mistake had been made in the selection of the site; but experience has shown (so the Chairman of the Electric Lighting Committee, Mr. Pearson, says) that the conveniences of the site outweigh all the early troubles—indeed, so great is his faith in it that he has had no hesitation in asking the Council to proceed with extensions of the works involving an ultimate expenditure of £75,000. The original cost per lamp to the city was £3; but with the proposed enlargement, the cost will only be £1 16s., with a horse power equal to 5000. The public lighting has remained practically the same from the beginning; but the private demand has increased so satisfactorily that the revenue for the year ending September next, it is expected, will be nearly £6500. The result of the trading last half year was, after paying all the station expenses, interest, and sinking fund, a profit of about £1500. When the additional works are complete, the Corporation will be in a position to supply the whole of the tramway service with motive power; but it appears, from remarks made by Alderman Dix and other councillors, that it is absurd to expect the Company to take motive power from the Corporation, seeing that they already possess works of their own. The Council, however, acquiesced in the Committee's proposals.

What is refinedly described as a "suspension" of the supply of electricity occurred at Hanley on March 23. The breakdown happened at 2.45 on that day; and it was not until one o'clock the next morning that it was localized. It was found that two joint-boxes had failed; causing the conductors to become fused together. The engineers are now directing their attention to the isolation of the

different districts, in order to render it easier to locate and remedy faults when they occur, and to confine the suspension to one district only. This will entail some outlay, as well as greater trouble in the necessary testing each week.

For the purpose of extending the electric lighting of the streets, and carrying out works in connection with the distributing system and generating station, the Worcester Corporation have applied for the sanction of the Local Government Board to the borrowing of £6850. Colonel Marsh held an inquiry into the matter last Tuesday; and there was no opposition.

The "old, old story" in connection with the installation of electric lighting systems in towns is being re-told at Croydon. When the original loan for the work in that borough was applied for, it was said that the amount would be more than sufficient; but already the General Purposes Committee have applied to the Council for further funds. The Council's expert is Professor Kennedy. It seems that he has lately been going into the question of arc lighting in some detail, and finds that it is not possible, with such a scheme as he thinks the Council would be well advised to adopt, to include it under the original loan. The necessary additional expenditure for the arc lighting would be £1500; but while the Corporation are applying for further borrowing powers, he suggests that it would be advisable to tack on the trifling sum of £3200 for condensing plant and a chimney at the station. To cover these proposals, the Electric Lighting Sub-Committee recommended the Council at a recent meeting to apply to the Local Government Board for £5000; and, in view of the extension of the electric light to areas outside that at present proposed to be lighted, to seek sanction at the same time to the borrowing of a further £5000. The Committee's recommendations were not favourably received by a number of the councillors; and an amendment was moved by Alderman Foss that the second £5000 be omitted from the application. Among others, this was supported by Alderman Goodwin, who pointed out that the Council were already committed to an expenditure of £37,500; and he did not suppose, if this expenditure had been brought up in the first instance, they would have so glibly passed the recommendation of the Committee, committing them to the electric light. It was admitted by the Chairman of the Committee (Alderman Miller) that a mistake in the estimate had been made. The amendment was defeated by one vote.

Considerable controversy has been excited at Exeter by the announcement that the Governors of the Devon and Exeter Hospital have decided to adopt the electric light in that institution. The gas-fittings were worn, and it was necessary to either replace them or to instal the electric light. No objection is made to the decision of the Governors in favour of electricity; but the manner in which the work is to be carried out is resented by those who were recently so strongly in favour of the Corporation acquiring the local electric light works. The hospital authorities made inquiries which convinced them that they could obtain better results by putting down a plant of their own than by becoming customers of the present Electric Light Company or of the prospective owners of the works—the Corporation. They accordingly propose to have a complete installation, including generating plant sufficient for the needs of the establishment. Now the people of Exeter want to know what the electric light works are really worth, if they are not equal to supplying an institution of so much local importance.

Contrary to expectation, the long-promised annual report of the Hampstead Electric Lighting Committee failed to put in its appearance at Thursday's meeting of the Vestry. This was more than some of the malcontents could stand, Mr. Johnson boldly accusing the Committee of delaying the report for election purposes. Mr. Thwaites, the Chairman of the Committee, bore the "soft impeachment" without much show of indignation; and the Vestry Clerk admitted that the accounts were ready, but that their presentation had been deferred by the Committee for another fortnight. Mr. Johnson thereupon asked the Chairman (Major-Gen. Young) whether he would be in order in moving that the accounts as prepared be submitted to each vestryman, so that they might be laid before the constituents. This was ruled out of order. The debate getting rather angry, the Vestry Clerk added that the reason of the delay was that the returns ordered by the Board of Trade were very complex and difficult to comprehend; and it was "with a view to putting them in a form that every member could understand" that their publication had been deferred. The accounts, however, were always open for the inspection of vestrymen. Mr. Johnson thereupon asked whether a vestryman could make extracts from these accounts with a view to disclosing them at a public meeting. As this, it was pointed out, would be a breach of confidence, Mr. Johnson declared that he would, at any rate, see the accounts for himself; and any further responsibility would attach to him personally. All this sounded very heroic, and, it must be confessed, caused some ribald laughter. But the palpable postponement of the electric lighting report until after the Vestry election is more than sufficient excuse for the suspicions of Mr. Johnson and those members who supported him.

At last Wednesday's meeting of the Stockton Corporation, a report was submitted from a deputation who had visited the principal electric lighting works in the north. In almost all cases where the electric light had been provided, financial success, they stated, had been attained; and the consumption of gas had not been appreciably prejudiced. To provide an installation for Stockton on the low-tension system would probably cost between £16,000 and £18,000. The Electric Lighting Committee recommended that the Council should seek from the Board of Trade a further extension of time for the supply of the light. This was agreed to. A petition was read from a number of the leading tradesmen against the Council adopting the light owing to the cost.

Another step has been taken by the Peterborough Corporation, notwithstanding powerful opposition, towards the provision of electric lighting for the city. An inquiry by one of the Inspectors of the Local Government Board (Mr. F. H. Tulloch) was held last Wednesday in connection with the application of the Corporation for power to borrow £20,000 for constructing the necessary works. The Town Clerk (Mr. Mellows) stated the case on behalf of the Corporation; and the Great Northern Railway and the dissentient ratepayers were respectively represented by the Hon. A. Capell and Mr. H. Percival. The system proposed to be adopted was described by Dr. A. J. Fleming. Mr. Percival urged that the scheme was confined to such a small proportion of the area of the borough as to be unfair to the ratepayers generally; and he submitted that as the city was committed to a large expenditure for other necessary and more important improvements, the present was an inopportune time to enter upon further outlay. Mr. Capell expressed similar views on behalf of his clients. He added that the Great Northern Railway Company were ratepayers to the extent of one-fifth of the ratepayers of the city. Although they would be unwilling to oppose any proposal for the benefit of the community at large, they would not take any part in this scheme; nor, if it were carried out, would they use the current for lighting their premises. Several witnesses gave evidence for the opposition; and, in the course of the proceedings, the Town Clerk mentioned that the members of the Council in favour of the scheme were only in a majority of one.

The Board of Trade have refused to grant the licence applied for by the Bangor (Carnarvon) Town Council to empower them to supply electricity. There was a remarkable consensus of opinion in the town in opposition to the scheme.

The Electric Lighting Committee of the Bath Town Council have recommended the purchase of the Electric Light Company's undertaking for £24,533. This amount was fixed as a result of a valuation by Professor Kennedy, who was appointed as an independent valuer by the Board of Trade. At the request of the Board there was a conference between the parties concerned yesterday; but it was previously distinctly laid down by the Council that their representatives should have no power to depart from the sum above specified.

Colonel Marsh held an inquiry at Worcester last Tuesday relative to an application by the Corporation for the consent of the Local Government Board to the borrowing of an additional £6850 for electric lighting purposes. Of this sum £1680 is required for street lighting; and a large portion of the remaining £5000 has been spent on the extensions of mains and on work at the generating station.

We have at various times had occasion to refer to the electric lighting of Taunton; and the latest particulars to hand are not of a very reassuring character. If they had been furnished by someone pecuniarily interested in the supply of gas, they would probably be characterized as the carpings of a partisan of a competing system of illumination. But they come from no less a personage than the Chairman of the Finance Committee of the Corporation (Mr. J. Standfast). In a letter recently addressed to a local paper, complaining of the way in which he had been attacked by the Editor for certain remarks made at a recent Council meeting, Mr. Standfast deals with the position of the electric light undertaking, a discussion on which had evidently called forth some adverse comments. It appears that the Chairman of the Electric Light Committee (Mr. Alderman Potter) confessed on the occasion in question that, instead of there being an increase in the revenue from private lighting, there had been a decrease of £57. This was precisely what Mr. Standfast had predicted over and over again. Of course, his vaticinations had been pooh-poohed. It was said that all that was needed was for the Corporation to "buy up the bankrupt company's undertaking, to give the public confidence to take the light." But Mr. Standfast shows that results have proved that those who have taken upon themselves the management of the undertaking are unfitted by the want of exceptional sagacity and common sense. He goes on to tell the following story: First of all, they were told that £15,000 would be sufficient to purchase and extend the works and make them pay. But after having possession of them for about a year, the £15,000 was gone, and £2000 more was wanted, with the prospect of an additional £3000 being required in a few years. After the Local Government Board granted permission to borrow £5000, £2000 of it went in a few months; and by the expiration of a few more, not only had the other £3000 gone, but upwards of £2000 had been spent without the Council being made acquainted with the fact. This is a very instructive narrative. But when Mr. Standfast rises in his place in the Council Chamber, and shows how the money has been wasted, he is insulted by his fellow-members and "slated" (and he says misreported) by the Press. He is charged with being prejudiced. He replies that his prejudice is not personal, but for the general good. He had no shares in the Electric Light Company, nor has he any in the Gas Company. He says it is as reasonable for him to be prejudiced against a system which is fast running the town into debt and difficulty as it would be to be prejudiced against wild beasts, poisonous serpents, foul water, or miasma. With the £3000 to be borrowed, there will be a debt of £23,536 on the electric light works; and there will have to be paid annually £1345 on account of principal and interest. Wages and materials will come to £2054; and other items will bring up the yearly expenditure to £3560. As the total income will be £2456, there will be a loss of £1104. Adding to this the extra cost of electricity for public lighting, £646, Mr. Standfast shows that the electric light is responsible for an annual charge on the rates of £1750; being equal to a rate of more than 6d. in the pound. This is a very pleasant prospect for the ratepayers, especially coupled with the statement of an electric contemporary to the effect that "until the arrangement of the plant has been entirely altered, the works cannot show very economical results."

Public Lighting a Luxury.—Colonel Langton Cooke has just held an inquiry at West Thurrock, on behalf of the Local Government Board, with respect to an application for power to borrow money for the purposes of public lighting. It was strongly opposed by a number of influential residents and manufacturers, on the ground that the rates are already very heavy, and that the lighting will be nothing more than a luxury which can very well be dispensed with.

A Curious Complaint as to Incandescent Gas Lighting.—The Trinity Pilots using Shoreham Harbour have made a somewhat remarkable complaint to the local authorities of Southwick, who have recently adopted incandescent gas lighting in their district. It is complained that on very dark nights the lamps throw such a powerful light around them that pilots entering the port with vessels are unable to see the buoys indicating the course to the lock gates and the canal; and they ask that the lamps may be darkened on the side which is nearest the sea at this part.

THE STOCKPORT WATER COMPANY'S NEW WORKS AT WILMSLOW.

At the invitation of Mr. Alfred M. Price, the Secretary of the Stockport District Water-Works Company, a representative of the "JOURNAL" had an opportunity, during the past week, of visiting the new works the Company have erected at Wilmslow, which will enormously increase the water supply for the above district. He was accompanied round the works by Mr. J. Atkinson, the Borough Surveyor of Stockport, Mr. Price, Mr. T. Molyneux, the Company's Engineer, under whose supervision the works have been carried out, and Mr. Timmins, of the firm of Messrs. Ebenezer Timmins and Sons, Bridgewater Foundry, Runcorn, the contractors for the work in connection with the new supply, who furnished full particulars of the plant put down. For the last thirty years, the Company have had, at Wilmslow, a borehole about 130 feet deep, and from this they have been obtaining 150,000 gallons of water daily. This, however, has now been superseded by a boring more than 600 feet deep; which will probably yield about a million gallons a day; while space has been left for the sinking of other boreholes, from which it is estimated that the supply, when requirements arise, will not be less than from 3 to 4 million gallons daily. It may be added that Mr. C. E. De Rance, F.G.S., of the Geological Survey, and Mr. J. W. Gray, F.G.S., were first consulted as to the advisability of boring to a greater depth at the Wilmslow works; and their opinion has been amply justified by the results that have been so far obtained.

The works now consist of a well 9 feet internal diameter, and 21 feet deep, lined with 14-inch brickwork, and having a concrete floor 18 inches thick, into which is fixed a stand-pipe, to which the delivery-pipes, &c., are bolted. From the bottom of the brick well, there is a borehole 104 feet deep and 28 inches in diameter, lined with steel tubes of 25-inch bore; the annular space outside the tubes being filled with special cement. From this depth—125 feet—there is a 14-inch unlined borehole, 477 ft. 3 in. deep; making a total bore of 602 ft. 3 in. The first length of 104 feet is lined so as to prevent any contamination by surface water, and before any rainfall can gain access to the borehole, it would have to penetrate in a direct course at least 135 feet of sandstone, the whole of the rock passed through being of the new red sandstone series. Messrs. Timmins and Sons commenced their portion of the works on May 8, 1894; and by Nov. 9 of the same year the whole of the boring and lining was completed. At depths of 450, 500, 550, and 602 feet respectively, tests were made of the approximate quantity of water available; and the last was so satisfactory that the boring was stopped, and Messrs. Timmins were instructed to provide and fix a lift-pump capable of raising from 750,000 to 1,000,000 gallons per day, together with the requisite engine and all accessories. The one put down is a compound tandem engine, of 35 nominal horse power, fitted with Proell's automatic expansion gear. The cylinders are 8 inches and 14 inches in diameter; the stroke being 22 inches. The lift-pump (made by Messrs. Timmins) is driven by a connecting-rod from the crank on the mortice-wheel shaft to a double L leg, to one end of which the ram of the lift-pump is attached, the other end carrying the balance-weight. From the bottom of the ram, the pump-rods pass down the rising main, which consists of wrought-iron tubes screwed together, to the bucket, which works in a gun-metal barrel fitted on top of the slack box, which is 125 feet from the surface, on top of the 14-inch borehole, down which there is a short length of suction-pipe. The stroke of the pump is 4 ft. 6 in.; and the working barrel is 18¾ inches in diameter. The water on being lifted passes up the rising main from the bucket, and on the downstroke is forced by the ram, which is 14 inches in diameter, through the delivery-pipe to the outlet of a tank adjacent to the engine-house. The tank and river wall form the boundary to the Company's land. The wall which divides the tank from the River Bollin is 15 feet high from the rock foundation, and is made of concrete faced with rubble. The tank walls are also of concrete, faced inside with 4½-inch brickwork, and will hold 100,000 gallons; the roof being made water-tight, and kept covered with water. By means of gauges at the inlet, the quantity of water yielded by the borehole can be accurately measured. The water passes from this tank through a 12-inch cast-iron pipe to the well on the borehole in the old engine-house adjoining, and is then distributed by means of three force-pumps. One of these is 12 inches in diameter and 3-feet stroke, and is capable of lifting 450,000 gallons per day against 180-feet head; the second is 12 inches in diameter and 2 ft. 6 in. stroke, and is equal to lifting about 450,000 gallons per day against 180-feet head; and the third has three rams, 4 inches in diameter and 8-inch stroke, and will lift about 100,000 gallons against 400-feet head—that is, to the Company's reservoir at Alderley Edge. New mains have been laid, and arrangements made so that either of the two first-named pumps can be used to distribute the water in either portion of the district between Stockport and Alderley; and the Company also intend to lay a new main between the Wilmslow engine-house and the Alderley Edge reservoir. Provision is being made for the housing of a duplicate plant, if at any time it should be found necessary. The additional steam power required for the extra plant necessitated the provision of a new boiler, which has a length of 26 feet, with a diameter of 7 feet, to carry 120 lbs. steam-pressure.

It may be added that the Company, who serve a population of 120,000, covering the districts of Reddish, Heaton Norris, Heaton Mersey, Stockport, Cheadle, Gatley, Disley, Hazel Grove, Alderley, and Wilmslow, have already two reservoirs at Lyme Park, Disley, from which they obtain about 1½ million gallons of water per day; while they have a contract by which they can be supplied with a million gallons daily from the Manchester Corporation. To these is now added the supply from the new Wilmslow works, of about a million gallons per day; so that the requirements of the district will be fully met. Valves have been put in the Wilmslow mains, by means of which the water could, if necessary, be forced into the Stockport mains, though it is not proposed to do this at present.

THE ADMINISTRATION OF THE HULL CORPORATION WATER-WORKS.

Several Officials to Resign.

At the Meeting of the Hull Corporation last Thursday, the Chairman of the Water Committee (Alderman Massey) brought forward the report on the above subject, a notice of which appeared in the "JOURNAL" for the 28th ult. Before the discussion commenced, a letter was read from the Water Engineer (Mr. B. J. E. Bruce), protesting against the manner in which the inquiry had been conducted, and appealing to the Council to give him an opportunity of meeting his accusers, and proving his own case before they came to a final decision. Alderman Massey, in moving the adoption of the minutes, said a very painful obligation rested upon him as the Chairman of the Committee. He regretted to have been compelled to take this course; but he did it, feeling conscientiously and sternly, that it was the only recommendation they could make. He had the letter read from the Engineer; and all he had to say on the point was that Mr. Bruce could, if he had so desired, have called witnesses before the close of the inquiry. He did not seek the position of Chairman of the Committee. The Council elected him as a member of the Committee; and his colleagues placed him at their head. When his first visit to the works was made, he very soon saw what the position of affairs was. The ratepayers of Hull had invested practically half a million of money in the water supply of the town; and he saw that there was no competent head or administrator to take charge of these important works, but that the head or chief was a man who, according to his (Alderman Massey's) humble opinion, was absolutely incompetent for the position which he was filling. They had not rushed into this inquiry; they had taken fifteen months to arrive at a careful judgment on the position. The inquiry had been conducted with perfect fairness—that he thought every member of the Committee would admit; and the decision they had come to had been arrived at by the majority of the Committee. Proceeding, he said the course recommended by the Committee was the only safe one they could follow; and they must begin by making a clean sweep. Referring to other officials, and commenting on the affairs at the Springhead works, he said that slothfulness reigned supreme throughout the place, and indifference to the property under their charge was one of the leading features at the works. He described what he had seen himself at the works, and said that the whole safety of the water supply at Springhead had been hanging upon a single thread, on account of the condition of the machinery. As to the future, the town would have to make a considerable outlay in putting down new engines at Springhead, and in laying new mains. Mr. W. G. Wharram seconded the motion. Mr. Robson protested against the unconstitutional way in which he said the proceedings had been conducted from the beginning, remarking that it was a crying shame that they should wish to send these officials on to the world without having given them the opportunity of answering their accusers. With regard to one of them (Mr. Miller), he pointed out that this official had given 23 years' good service to the town. Referring to the Engineer, Mr. Robson denied emphatically the statement that Mr. Bruce had no mechanical knowledge or training; and he produced testimonials to the contrary. He complained that Alderman Massey had not brought any specific charges against the Engineer; also that there were too many engineers on the Committee, among whom Mr. Bruce had had too many masters, and so could not possibly do his duty. He moved, as an amendment, that the report be referred back for reconsideration; and that an expert engineer be called in who should be allowed to examine witnesses and report on the report and evidence. The Mayor (Alderman Richardson) ruled that all Mr. Robson could do at this juncture was to move that the report be referred back for reconsideration. Mr. Shaw seconded the amendment, and said that, after reading the report and evidence, he could not but feel that the Chairman was biassed. Mr. Broadberry, in supporting the motion, said Mr. Robson in his speech appealed more to sentiment than to common sense. Mr. Gillett supported the amendment, and regretted that he was in opposition to Alderman Massey in what he believed to be an honest attempt to remedy what he took to be seriously wrong in the engineering staff of the water-works. He could only express regret that Alderman Massey had on this occasion allowed his zeal to outrun his discretion. Alderman Massey said it was no use sending the report back, because the Committee could go no farther with it, and the Council knew the alternative. What they wanted was a chief who could look ahead, who could assist the Committee, and one in whom the Committee could put confidence. The minutes were adopted by 34 votes to 16.

Prior to the commencement of the ordinary business of the Water Committee at their meeting last Friday, the Chairman inquired of the Engineer whether he would tender his resignation, to come into effect from the date of the appointment of his successor; adding that it was his intention to suggest to the Committee that, on such retirement, Mr. Bruce should be given an allowance in lieu of a year's salary (£400). Mr. Bruce said he fully appreciated the kindness of the Chairman in making this suggestion; but he would like a little time to consider the best course to take. The Committee during the sitting resolved to advertise for an Engineer at a salary of £450 per annum.

Gas Affairs at Longton.—At last week's meeting of the Longton Town Council, a letter was read from Mr. W. W. Hulse resigning his position as Manager and Secretary of the Corporation gas-works, and reminding the Council that he had intimated his intention to resign prior to the recent investigation by Mr. T. Newbigging, whose report showed some of the difficulties he had had to contend with. (See *ante*, p. 930.) Mr. Hulse's resignation was received with regret. The Gas Committee recommended that a Manager be advertised for, at a salary of £300 per annum, and that he be responsible for the whole management of the undertaking, but that arrangements be made to provide him with the necessary clerical assistance. The Committee also reported that the number of slot meters fixed during the twelve months ended March 31 was 356; and that the collection from these for nine months was £1218 17s. 5d. The report was adopted.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Mr. Primrose, the Convener of the Watching and Lighting Committee, who was "bowled out" recently in the Glasgow Town Council, on a somewhat similar motion, this week moved again a proposal for a remit to his Committee to consider what equitable means might be devised for the improvement of the general lighting of the city, and to report. In support of his proposal, he said he supposed it would at once be admitted that the city was badly lit. He would go further, and say that, as contrasted with other less important cities of the kingdom, it was almost disgracefully lit. He could take them to many cities of minor importance, where even secondary thoroughfares were blazing with light, as compared with some streets that Glasgow looked upon as leading thoroughfares. He could take them to Belfast, a gas-lit town, that was absolutely radiant with light as compared with Glasgow. He recognized the measures that had been taken by the Health Committee in making the city healthy; and as a necessary part of progress from the lighting point of view, he regarded a well-lit city as absolutely an essential factor in a happy city life. In thinking about how they could improve things, his Committee recognized that the operations of the near future in connection with the tramway service, and the improvement of the electric light system, would probably deal with many thoroughfares. But some of the subsidiary streets would for years to come be gas-lit; and for this reason he would like to see them a great deal better illuminated than they were at present. The Watching and Lighting Committee had a somewhat large gas bill to meet every year. This year he thought he was correct in saying that for street lamps, court-lamps, and stair-lights, the bill would be £30,355. Any proposal to put a greater number of lamps on the streets would at once be met with opposition in Committee; and this naturally drove him to think of some other method by which additional expenditure might be partly met. In Birmingham, where the gas-works belonged to the Corporation, while the charge for private lighting was 2s. 4d. per 1000 cubic feet, they only charged 1s. 1d. per 1000 feet for public purposes. In Edinburgh, where the gas belonged to a separate Commission, the gas was supplied to the citizens at 3s. per 1000 cubic feet; and for the public lighting, the charge was 2s. 1½d. per 1000 cubic feet. He was quite aware that, under the present Act of Parliament, there might be difficulty in making a differential rate; but there was no reason why a remit should not be made to a Sub-Committee to consider if there was really no way of escape. His theory of the Corporation as gas producers was that they should be entitled to supply gas for the public service at a special price. He acknowledged that the Gas Committee were serving the city well; but he held that their financial position was unsound, in so far as they were making provision for futurity, which was not required. The profit made should be of more benefit to the ratepayer, who was paying from year to year. He was convinced that until they had a better lighted city, a reproach lay upon them. In the night time, Glasgow was depressing; and in secondary and subsidiary streets, it was almost darkness that might be felt. The motion was unanimously adopted. Mr. Primrose's action is to be commended, as are also his common-sense remarks. They entirely accord with my own observation. Except in the leading thoroughfares, the street lighting of Glasgow has been for years very far from what is to be seen in other towns. Too little gas is consumed; but, of course, when the full rate is charged, it is not to be expected that the Lighting Committee will take so much gas as they would if they received a concession in price.

The Town Council of Dumferline are, like so many bodies who have newly-acquired powers, disposed to be somewhat finical in their administration. After adopting the Burghs Gas Supply Act of 1876, it will be remembered, they discovered the difficulty about the electoral roll upon which the plebiscite of the community was to be taken; and much time and money were spent in setting matters straight. They have now found a new point on which to trouble themselves—viz., who is to act as their Clerk? The question has come up for consideration whether the work connected with the transfer comes within the scope of the duties and salary of the Town Clerk. The Committee were under the impression that it did; but someone has given the opinion that, as soon as the Act was adopted, the Town Council became Gas Commissioners, and therefore a new body. The question of whether or not this is the case, is to be before the Council on Monday. There are probably some who would maintain that the Council, as a Council, are the administrators of the Act, and that the duties fall upon the Town Clerk as a matter of course; while others may hold that the Town Council are administrators in a new capacity, and therefore require a Clerk. It is quite likely that the conflicting views are not held without some personal interest being behind them. Those who take the first view, may wish to have the services of the Town Clerk without additional remuneration; and those of the opposite opinion may desire to have another gentleman appointed to the clerkship, with, of course, a salary. I should think there ought to be little doubt as to the matter. The Burghs Gas Supply Act says distinctly that the Commissioners for executing the Act in any burgh shall be (1) the Town Council or (2) the Commissioners of Police. The Act gives authority to the governing body to delegate their powers to a Gas Committee; but says nothing about the appointment of a clerk, though it requires that "the clerk" shall keep the minutes of the body. Does not this clearly point to the existing clerk being the man who is to be in office? Truly any other arrangement would be troublesome, if not expensive. As the question of the appointment of a clerk is not mentioned, so neither is his remuneration; but this does not mean that he is to have no salary. Although, in this instance, it should be the Town Clerk who is to act, it does not necessarily follow that he is to do so for nothing; that will be a matter of arrangement between the Council and the Town Clerk. But it should be less costly to give the present Clerk an addition to his salary, than to appoint a new one.

The financial year of the Dundee Corporation Gas Department ended on April 30. It is announced that the revenue for the year amounted to £77,126, which is an increase over the amount in the preceding year of £2599. The revenue in the electricity department was £4882—an increase of £1206. Last year an increase of £2624 upon the gas revenue was reported.

It is cheering to observe that the Forfar Gas Corporation have, after all, taken thought of the matter of the explosion in their gas-works last November, and are now pursuing a safe course. Their feeling for a time seemed to lean in the direction of holding their Manager (Mr. Forbes Waddell) liable, morally, for the accident, the consequence of which, in honour to both parties, could scarcely have avoided a severance of the relationship of employer and employee. A step such as this would have been very much to the prejudice of Mr. Waddell, which would have been unfortunate; but the situation was such that a precedent might have been formed which would have led to serious results to others in time to come. It was there where the public interest came in. The latest resolution of the Commissioners—which was to consider Mr. Vernon Harcourt's report on the accident in committee, accompanied by the experience they would derive from a visit to the works—seemed to point to the existence of a belief that they could go beyond Mr. Vernon Harcourt. If any such notion were in the mind of any of them, they ought to know how dangerous a policy it would have been. To speak plainly, if the Commissioners had had the temerity to dismiss Mr. Waddell, they could only have done so after concluding that Mr. Vernon Harcourt was wrong. Such a position would be exceedingly difficult—I should say next to impossible—to establish; and if they did not establish it, there would be damages to pay to Mr. Waddell. The burgh has lost too much in litigation during the last year or two, to risk further outlay in a matter which would not bring them any benefit, in respect that it could not undo what has been done. It is therefore gratifying to learn that the Gas Committee met at the works on Thursday; and after discussing the whole circumstances of the case, they resolved to defer coming to a decision upon it until after the meeting of the North British Association of Gas Managers in July. Mr. Waddell is to read a paper on the subject at the meeting. The temper of gas managers is keen on the subject, as was shown by the few remarks made at the recent informal meeting in Glasgow. There will doubtless be much diversity of opinion upon many points, even among managers. There will probably be divergencies in details from Mr. Vernon Harcourt's conclusions; but it is scarcely to be expected that gas managers will go the length of seeking to overturn the decision on the whole matter which a Government official arrived at. If they cannot do so, how much less could the Forfar Commissioners, who necessarily are not in a position to rightly judge of the technicalities of a difficult subject?

There is, I am happy to be able to say, an improvement in the tone of the Hamilton Town Council towards Mr. W. Ewing, their Manager. Mr. Ewing has been remarkably successful in the management of the works; but notwithstanding this, there was an element of distrust of him in existence in the Corporation, which found vent in continual opposition to his proposals. His chief opponent was Mr. H. S. Keith, who is now Treasurer of the burgh. It is Mr. Keith's conversion to Mr. Ewing's views which I chronicle this week. On Thursday the Gas Committee recommended the Town Council that two new purifiers should be erected, similar to two which were procured about a couple of years ago. It is true that the mantle of the grumbler, which had been cast off by Mr. Keith, had fallen upon some others, who raised the cry that too much was being expended upon the gas-works. According to one of these critics, the Commissioners were told two years ago that they could not get along without more purifying plant, yet they had been able to do so, notwithstanding that the output of gas had been 25 per cent. more. He also said that people in the neighbourhood could not sleep on account of the smell from the purifiers; but this was not the fault of the purifiers—it was on account of the lime which was used. The fallacy of this man's position will be apparent to almost everyone. If there had been an increase of 25 per cent. in the consumption of gas, it was surely reasonable that there should be an enlargement of some part of the plant; and if the people in the neighbourhood were suffering from smells, would not that be because of the forcing of inadequate purifiers, and the frequent changing of them. Treasurer Keith—I am sure it must have been to the surprise of some of the critics—frankly stated that, though he previously opposed the proposal of the Manager, he now supported it. He had been informed by a practical expert that the present arrangement of working two new purifiers with four old ones was not economical. Besides, the proposal was in accordance with the recommendation of Mr. W. Key, of Glasgow, whom they consulted as to the extensions at the works. The recommendation of the Gas Committee was approved of.

The Falkirk Gas Commissioners have acquired a field, extending to nearly 2½ acres—part of the land scheduled in their Act of Parliament—for extensions of the gas-works. The purchase, though compulsory, has been effected amicably; the Commissioners having agreed to pay 30 years' purchase of the feuing price of the ground. The Commissioners have begun the work in connection with the new wire-rope guided gasholder they are about to erect. The site of the tank has been excavated to a depth of about 7 feet, and this, too, without encountering water, which is fortunate. In a fortnight from now, it is expected that the actual work of construction will be begun.

The annual coal contracts for the Dundee Corporation Gas-Works are announced this week. The quantity contracted for is 50,000 tons; and the average price is 11s. 1¼d. per ton. Last year the average price agreed upon was 11s. 8¼d., which was, again, about 6d. below the cost the preceding year.

In the course of the inquiry into the Edinburgh Extension Bill before a Committee of the House of Commons, ex-Provost Wood, of Portobello, who is Chairman of the Portobello Gas Company, was examined in support of the Bill. He stated that the Corporation of Edinburgh had agreed to acquire the Company's undertaking; and in cross-examination he said that the capital of the Company was £20,000, upon which they were to get 6 per cent. for 20 years. This is in accordance with the information I gave last week. Mr. Wood also mentioned that the shares (which were originally £4 each) were selling in the market last week at £8. The part of the Bill relating to the amalgamation of Portobello has been passed by the Committee; but the portion referring to the amalgamation of Leith was rejected. This, however, does not affect the gas supply, in which there is already co-operation between Edinburgh and Leith.

Peat has frequently been looked to as a substance from which gas might be made; but it has never hitherto been found profitable to work in this country. Mr. F. T. C. Linton, of Leith, experimented with it in 1893; and the illuminating power he got from three samples from different parts of the country was 1¼, 2¾, and 9½ candles respectively. It is now announced that a company, known as the Peat Carbon Syndicate, Limited (whose headquarters are in French Street, Bridgeton, Glasgow), are manufacturing a superior coke from peat; the yield containing over 90 per cent. of carbon. Along with the coke, about 13,000 cubic feet of gas of 16½-candle power is derived per ton of dried peat. Both the coke and the gas are said to be free from sulphur. The Syndicate do not seem to place so much store upon the gas as upon the coke which they obtain. It is stated to be equal in quality to oak charcoal, and to be particularly suitable for iron and steel smelting. There are said to be about six million acres of peat in the United Kingdom.

The hydraulic stoking machinery which has been brought into use in the Glasgow Corporation Gas-Works within the past few years has proved to be so efficient and economical—saving upwards of 1s. per ton of coal in the carbonizing account—that the Sub-Committee on Gas-Works have not had any hesitation in placing with Sir William Arrol and Co. orders for additional Arrol-Foulis machinery for the extensions now in progress at the Tradeston Gas-Works. Two of their patent charging-machines are to be supplied at a cost of £780; and they are also to supply two of their patent drawing-machines, the contract price of which is set down at £270. The firm are likewise to supply two coal-breaking machines, the cost of which will be £560; the total amount of the contracts being £1610.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *May* 9.

Sulphate of Ammonia.—The activity of the closing week of April has quite disappeared; immediate requirements being filled, and buyers declining to go on at the advance. Closing quotations are £8 and £8 2s. 6d. f.o.b. at the ports. Having for the most part disposed of their ready stuff, and the season of small production in England having now arrived, makers are not pressing sales. But in Scotland the large production continues; and there sellers are showing greater readiness to meet the market. Dealers are still picking up parcels at current prices; but, for prompt delivery, direct buyers are not much interested. For May-July and following months, there is, however, good inquiry; and business is being done at a fair premium. The demand for home consumption is tailing off; but there is some buying going on for stocking. There is considerable inquiry for October-March. But, in this position, buyers cannot yet bring themselves to pay the premium asked by sellers; and consequently there is not much actual business doing. In regard to the future, in so far as nitrate of soda is likely to affect sulphate of ammonia, it would seem to be advantageously.

Nitrate of Soda.—Notwithstanding the relatively high price of nitrate of soda, the deliveries, U. K. and Continent, up to the end of April—580,000 tons—have been 75,000 tons in excess of those over the same period of any previous year. This is partly accounted for by the unusually early season; and there will no doubt be some falling off in May as compared with previous years. But at the end of the season, the excess will probably be found to be quite 50,000 tons above any previous record. Supplies, however, have been, and are, ample; and it is not likely that spot price will advance materially until next season approaches, when higher prices must be looked for. If the stock in Europe is added to the quantity now afloat, the visible supply is seen to be about 370,000 tons, which is 80,000 tons in excess of that at the end of April last year. If to the above visible supply be added the quantity still to be shipped up to the end of March, 1897, and should the consumption over the next twelve months equal that of the past year, there will be a surplus of some 80,000 tons; but should there be a further similar increase in consumption, the estimated surplus will practically disappear, and a substantial advance in price may be expected. Spot price is 7s. 10½d. per cwt. for ordinary, and 8s. for fine quality. Due cargoes are worth about 7s. 10½d. per cwt., ordinary quality; and autumn shipments, 8s. 4½d. and 8s. 6d. per cwt., according to position.

LONDON, *May* 9.

Tar Products.—There is very little new business reported in this market; and most of the leading products are dull and uninteresting. Carbolic acid is a shade easier; and crystals, it is stated, are not in parity with crude. A further fall is noted in crude naphtha, which is now quoted at 8½d. per gallon; showing that benzol refiners have very little faith in the present market quotations. A little more business is being done in creosote and tar grease oils; and distillers will be glad to get relieved from the heavy stocks most of them hold of these products. Pitch is somewhat disorganized; and, while some makers report sales at good prices, others not so well placed are selling outside lower, even after taking into account the difference in port of shipment. Outside makers continue to shade the price of anthracene, and are thus keeping clear of stocks. It is stated that there are no stocks of anthracene outside the Committee; and it is also reported that the Committee are well sold in this article. Several important tar contracts have been let during the week at prices ranging between 17s. 6d. and 23s., according to position; and the nominal quotations for other products are: Pitch, 30s. to 32s. 6d. Benzols, 90's, 1s. 10d.; 50's, 1s. 7½d. Toluol, 1s. 4½d. Solvent naphtha, 1s. 2½d. Crude, 30 per cent., naphtha, 8d. Creosote, 1⅛d. Salts, pressed, 53s.; drained, 30s. Cresylic acid, 1s. Carbolic acid, 60's, 2s. Anthracene, "A" quality, 10½d.; "B," 8d. to 9d.

Sulphate of Ammonia is not quite so strong; but there are more inquiries in the market for it, especially for forward delivery. The large shipments that have taken place so far this year—much in excess of the corresponding period of last year—should tend to improve the value as the season advances, and the lessened production is felt. Business has been done at £8 2s. 6d. to £8 10s. London; £8 2s. 6d. Liverpool; £8 to £8 5s. Hull; and £8 to £8 2s. 6d. Leith. Gas liquor is nominally quoted at 5s. 6d. to 7s.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Except that a little extra buying is going on here and there, as a precaution against any possible stoppage of the pits—not, however, to a sufficient extent to indicate any really general apprehensions of such a contingency—there is no appreciable improvement to notice as regards the position in the coal trade here; and four days per week continues the general average that the pits are working. For house coals, the demand is necessarily tapering off considerably; but some of the collieries are still doing a fair business, which is keeping them on practically full time. Prices are steady at late rates, but show no signs of any upward move. Best Wigan Arley only in special cases realizes above 10s. per ton at the pit, with Pemberton four-feet and seconds Arley averaging 8s. to 8s. 6d., and common house coal, 7s. to 7s. 6d. The lower qualities of round coal meet with no better demand; and with supplies excessive, prices are cut extremely low. Special sales are being made at 3d. to 6d. per ton under the current prices, which average about 6s. per ton for good ordinary steam and forge coals. Some inquiries for gas coals have been on the market during the past week; but it is too early as yet to give any definite quotations, nothing having been done to really fix prices. In engine fuel, there is a considerable weight of extra buying going on, on the part of users anxious to get in stocks; and fair inquiries for forward contracts, which are evidently the outcome of precautionary measures in the event of the wages question resulting in another dispute and consequent cessation of work at the collieries. Slight advances are, here and there, being obtained; but prices generally, though showing a tendency to harden, are without quotable change. Best slack remains at about 4s. 6d. to 5s. per ton at the pit; with common sorts averaging 3s. 6d. In the shipping trade, the weight of business doing continues very limited; and prices show no improvement. Ordinary steam coal is still obtainable at 7s. to 7s. 3d. per ton, delivered at the Garston Docks, the High Level, Liverpool, or the Partington tips of the Manchester Ship Canal.

Northern Coal Trade.—The coal trade of this district has been agitated during the last few days by the great amalgamation of collieries briefly hinted at last week—the acquisition of the pits now owned by the Earl of Durham by the firm of Sir James Joicey and Co. It is anticipated that from the beginning of next month the transfer will have a considerable effect, both on the gas and steam coal trades. The Baltic demand for coal has now set in; and there is fuller work at the collieries which export a considerable part of their output. Best Northumbrian steam coals are quoted at 8s. 3d. per ton f.o.b.; second-class coals, at about 7s. 6d.; and steam smalls, at 3s. 9d. There is no alteration of moment in the demand for manufacturing coals; but the volume of demand seems a little larger. In gas coals, some of the local contracts that have been in the market for the past week have been concluded; and though the price varies according to the position of the pits, it is believed that it will average about 6s. 3d. to 6s. 6d. per ton f.o.b. In the coke trade, there is a further improvement, both in the home demand and because there is now the commencement of the exports to the Baltic. The price is still on the basis of 13s. 9d. per ton at the Teesside furnaces; while for export, the quotation averages 15s. per ton f.o.b. There is little movement at the present time in the gas coke trade. But the production of this fuel is low; and, with some export, stocks are showing signs of decrease.

Scotch Coal Trade.—Still no change can be reported in the coal trade of Scotland. The volume of trade is increasing, chiefly owing to foreign orders; and the increase is larger than is at first apparent, when it is considered that the domestic consumption is now down to summer level. There is also a large trade demand at home. Prices, however, show no sign of rising, either for present or forward delivery. Indeed, judging from gas coal contracts which are still being entered into at lower prices, they seem disposed to come down further, always barring outside influences. The prices quoted are: Main, 5s. 9d. (easy) per ton f.o.b. Glasgow; ell, 6s. 3d. to 6s. 9d.; splint, 6s. 3d. to 6s. 6d.; and steam, 7s. 6d. The shipments for the week amounted to 189,614 tons—an increase of 37,551 tons upon the preceding week, and of 51,684 tons over the same period of last year. For the year to date, the total shipments have amounted to 2,221,707 tons—an increase on last year of 145,717 tons.

Gas and Water Main Extensions at St. Helens.—Mr. R. Walton sat at the Town Hall, St. Helens, last Thursday to hear evidence respecting an application by the Town Council for the sanction of the Local Government Board to the borrowing of (among other amounts) £2000 for gas-main extensions, and £2600 for laying new water-mains. The Town Clerk (Mr. W. J. Jeeves), referring to the first-mentioned sum, said it had been the custom each year to set aside out of the income a certain sum for the extension of mains. During the eighteen years the Corporation had had possession of the gas-works, they had spent more than £20,000 on mains. The present proposed expenditure was so large that the Committee felt they were not justified in charging the whole of it on this year's income. Mr. Mearns, as a large ratepayer, objected to the proposed loan. There was never any need to borrow money as far as the gas-works were concerned. The Committee were making enormous profits, which were devoted, not to the reduction of the price of gas and the consequent benefit of consumers, or to the carrying out of the extension of mains, but to the lowering of the general rate, in which everybody, including non-gas consumers, participated. The Town Clerk stated that when the Corporation acquired the works, the price of gas was 4s. per 1000 cubic feet; and now the net charge was 2s. 5d., which was lower than the average of other towns. The gas profits were only £1500 a year, and had it not been for the general fund being responsible in the first instance, the consumers would not have enjoyed their present benefits. The other items were afterwards explained to the Inspector, and no objection was raised to them.

Barry Gas and Water Undertaking.—A statement as to the first year's working of the Barry gas and water undertaking under the direction of the District Council has been published. The year closed on March 31 last; and up to that date, the Council had received 350 fresh applications for gas and water. The gross rental was £2000 in excess of any preceding year. The capital expenditure in the twelve months, including money spent upon mains, new service-pipes, and a new house at Bigh's pumping-station, amounted to £5180. The net profit for the year was £6400, exclusive of the interest paid upon the stock (£202,250), and the small amount of debenture stock outstanding. Taking all things into consideration, and among them the fact that the Council have made a uniform rate of payment for water for baths and other purposes, and other improvements from which the public will benefit, there is a balance of £150 after making all these payments.

Holywood Gas Company, Limited.—A meeting of this Company was held on the 4th inst.; Dr. Henry Murney, J.P., presiding. The Secretary (Mr. J. H. Barrett) read a statement of the accounts for the past year, which showed the affairs to be in a prosperous state. The Directors recommended the payment of a dividend at the rate of 5 per cent. per annum. On the motion of Sir Daniel Dixon, D.L., seconded by Mr. J. Mitchell, it was unanimously resolved to reduce the price of gas from the 1st inst. to all consumers (save to those under special contract) by 10d. per 1000 cubic feet, which is equal to nearly 17 per cent. The Directors hope that this liberal reduction—which makes the present price (4s. 2d.), considering the population and the superior quality of the gas supplied, cheaper than that obtaining in any town similarly circumstanced in Ireland—will lead to an extended use by the consumers. The Company, desirous of keeping pace with the times, some years ago adopted prepayment meters, and have a number of them in use, all of which are giving the utmost satisfaction and gaining in popularity. They are set to give 20 cubic feet of gas for a penny.

Birmingham Corporation Gas Affairs.—Among the items of business not reached at the meeting of the Birmingham City Council last Tuesday were two motions relating to the Gas Department. One was by Mr. Lane protesting against the Gas Committee spending upwards of £60,000 on water-gas plant, without the approval or knowledge of the Council, and deprecating the practice of incurring expenditure before it has been reported (as provided by the standing orders) and approved. The second notice of motion was by Mr. Bisseker, who proposed asking that the Gas Committee be instructed to report, among other matters, what amount has been passed to the credit of the reserve and sinking fund accounts since 1876; and what sum has been so passed in excess of statutory requirements. From 1876 to March 31, 1895, there has been debited in revenue account, under item No. 5, repairs, maintenance of plant, &c., £1,138,278, and under item No. 7, repairs, maintenance of mains, &c., £323,384, or a total of £1,461,644. He desired to know how much of this amount has been expended upon repairs and new plant or mains.

A Modern Saturator.—A feature of the May Day demonstration at Bolton this year was a lurry containing a huge solid plate-lead saturator of modern design, made by Messrs. J. Taylor and Co., of that town; this being the fourth delivered during the present year by the same firm at the Darwen Gas-Works and elsewhere. This modern saturator was made entirely without the oxy-hydrogen blowpipe.

Totnes Water Supply.—Two questions relating to the water supply have lately been under the consideration of the Totnes Town Council. In the first place, the Water Committee presented a report by Mr. E. Sandeman, the Water Engineer of Plymouth, on a leakage from the new reservoir. He recommended that a puddle trench should be constructed right across the valley, which he believed would effectually prevent further waste. The Committee were unanimous in their approval of the suggestion; and Mr. Kellock, the Chairman, expressed the opinion that, when the work was carried out, the town might be congratulated on its water supply. The report was confirmed. The other question had reference to the supply of Dartington—a district just outside the borough. A memorial from the parishioners asked that a supply might be granted on the same terms as water is sold to residents in the borough. The Mayor (Mr. H. Symons) said the really important question was whether they could spare water for those outside the borough. Mr. Kellock thought difficulties might arise; and he suggested that, in connection with the application, the larger question of the incorporation of Dartington should be considered. Other members were of the same opinion; but, in the end, the memorial was referred to the Public Health Committee.

The London County Council and their Parliamentary Expenses on Water Questions.—At the meeting of the London County Council last Tuesday, the estimates for the year ending March 25, 1897, were submitted. The expenditure included £15,000 for parliamentary proceedings; and Lord Onslow proposed that this should be reduced by £5000. He observed that the estimate included amounts for promoting the Council's Water Bills. There were now no such Bills. He also pointed out that the parliamentary work of London had been undertaken by another authority; and he thought the Council ought to show its appreciation of this generosity by reducing the vote. Mr. M'Kinnon Wood, the Chairman of the Parliamentary Committee, said he had no objection to the reduction, though he had to the way in which Lord Onslow had brought forward his motion. In view of the fact that the Council's General Powers Bill and the Vauxhall Bridge Bill had already been passed, he thought the estimate might safely be reduced, though he would point out that a considerable sum would be necessary to oppose the Water Companies' Bills. The estimate was reduced by £5000. Subsequently, Lord Onslow, referring to the estimate of £5000 submitted by the Water Committee for pursuing inquiries into areas of supply, said he hoped this vote would not be taken as an expression of opinion from the Council in favour of the Welsh or any other scheme. Mr. Dickinson, the Chairman of the Committee, said they were preparing to report again at length on the Welsh scheme.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 1024).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	15 Apl.	10½	Alliance & Dublin 10 p. c.	24½–25½	..	4 2 4
100,000	10	„	7½	Do. 7 p. c.	17–18	..	4 3 4
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	110–112	+1	4 9 3
200,000	10	16 Oct.	4	Belgrano (B. Ayres), Limited	8½–9½	..	4 4 3
100,000	Stck.	30 Dec.	5	Do. 5 p. c. Deb. Stk	95–100	..	5 0 0
200,000	5	14 Nov.	6½	Bombay, Limited	7⅞–8	+⅛	4 1 3
40,000	5	„	6½	Do. New, £4 paid	5¾–6	+¼	4 6 8
380,000	Stck.	27 Feb.	12	Brentford Consolidated	280–285	..	4 4 3
210,000	„	„	9	Do. New	217–222	..	4 1 0
50,000	„	„	5	Do. 5 p. c. Pref.	—	..	—
159,375	„	16 Dec.	4	Do. 4 p. c. Deb. Stock.	127–132	..	3 0 7
220,000	Stck.	27 Mar.	11	Brighton & Hove Original	232–237	..	4 12 10
208,820	„	„	8	Do. A Ord. Stk.	187–192	..	4 3 4
933,500	Stck.	27 Feb.	5	Bristol, 5 p.c. max.	127–132	..	3 15 9
420,000	20	27 Mar.	11¼	British	55–57	..	3 18 11
50,000	10	12 Mar.	11½	Bromley, Ordinary 10 p. c.	22½–23½	..	4 17 10
71,000	10	„	8½	Do. 7 p. c.	19–20	..	4 5 0
500,000	10	29 Apl.	5	Buenos Ayres (New) Limited	9–9⅛*	..	5 5 3
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	102–104	..	5 15 5
150,000	20	27 Feb.	8½	Cagliari, Limited	29–31	..	5 6 5
100,000	10	27 Sept.	8†	Cape Town & District, Ltd.	15–16	+⅛	5 0 0
50,000	50	2 May	6	Do. 6 p. c. 1st Mort.	58–60*	+3	5 0 0
550,000	Stck.	15 Apl.	13½	Commercial Old Stock	337–342	+2	3 18 11
165,000	„	„	10⅔	Do. New do.	255–260	..	4 0 9
165,000	„	16 Dec.	4½	Do. 4½ p. c. Deb. do.	147–152	..	2 19 2
800,000	Stck.	16 Dec.	13	Continental Union, Limited.	285–290	..	4 9 8
200,000	„	„	10	Do. 7 p. c. Pref.	217–222	..	4 10 1
51,600	Stck.	27 Feb.	14	Croydon Com'cial A 10 p. c.	—	..	—
157,500	„	„	11	Do. B 7 p. c.	—	..	—
535,000	Stck.	27 Feb.	5½	Crystal Palace Ord. 5 p.c. Stk	130–135	..	3 17 9
60,000	„	„	5	Do. 5 p. c. Pref.	—	..	—
486,090	10	30 Jan.	11	European, Limited	26–27	..	4 1 6
354,060	10	„	11	Do. £7 10s. paid	17½–18½	..	4 9 3
5,746,590	Stck.	13 Feb.	12½	Gaslight & Coke, A, Ordinary	303–307	+1	4 3 0
100,000	„	„	4	Do. B, 4 p. c. max.	108–113	..	3 10 9
665,000	„	„	10	Do. C, D, & E, 10 p.c. Pf.	295–300	..	3 6 8
30,000	„	„	5	Do. F, 5 p. c. Prf.	145–150	..	3 6 8
60,000	„	„	7½	Do. G, 7½ p. c. do.	210–215	..	3 9 9
1,300,000	„	„	7	Do. H, 7 p. c. max.	204–209	+2	3 7 1
463,000	„	„	10	Do. J, 10 p. c. Prf.	290–295	..	3 7 10
476,000	„	„	6	Do. K, 6 p. c. Prf.	168–172	..	3 9 8
1,061,150	„	16 Dec.	4	Do. 4 p. c. Deb. Stk.	140–143	+1½	2 15 11
294,850	„	„	4½	Do. 4½ p. c. do.	150–155	+2	2 18 0
908,000	„	„	6	Do. 6 p. c. do.	204–209	..	2 17 5
70,000	10	30 Oct.	6	Hongkong & China, Limited	13–14	..	4 5 8
3,800,000	Stck.	14 Nov.	12	Imperial Continental	257–260	..	4 12 4
376,400	100	1 Feb.	4	Do. 4 p. c. Debs. Red.	100–103	..	3 17 8
473,600	Stck.	13 Feb.	3½	Do. 3½ p. c. Deb. Stk „	108–110	..	3 3 8
75,000	5	16 Dec.	6	Malta & Mediterranean, Ltd.	6½–7	..	4 5 8
560,000	100	1 Apl.	5	Met. of Melbourne, 5p. c. Deb.	115–118	+1	4 4 10
250,000	100	„	4½	Do. 4½ p. c. Debs.	110–112	+1	4 0 4
541,920	20	14 Nov.	5	Monte Video, Limited	17–18	–½	5 11 1
150,000	5	28 Nov.	8	Oriental, Limited	8⅛–8⅜	..	4 11 5
135,000	5	„	8	Do. New, £4 10s. paid	7¾–7¾	..	4 12 10
15,000	5	„	8	Do. do. 1879, £1 paid	1½–2	..	4 0 0
60,000	5	12 Mar.	7	Ottoman, Limited	5–5½	+¼	6 7 3
166,870	10	—	2	Para, Limited	1¼–1½	+¼	—
420,000	100	2 Nov.	6	People's Gas } 1st Mtg. Bds.	105–110	..	5 9 1
500,000	100	9 Dec.	6	of Chicago } 2nd Do.	105–110	+5	5 9 1
250,000	10	27 Mar.	8	San Paulo, Limited	13½–14½	..	5 10 4
500,000	Stck.	13 Feb.	15½	South Metropolitan, A Stock	400–410	+5	3 15 7
1,350,000	„	„	12	Do. B do.	315–320	..	3 15 0
310,000	„	„	13	Do. C do.	330–340	..	3 16 6
800,000	„	16 Jan.	5	Do. 5 p. c. Deb. Stk.	175–178	..	2 16 2
60,000	Stck.	12 Mar.	11½	Tottenham & Edmonton, A	250–255	..	4 10 2
60,300	„	„	8½	Do. B	—	..	—
170,380	10	30 Dec.	10	Tuscan, Limited.	13½–14½	..	6 18 0
149,900	10	2 Jan.	5	Do. 5 p. c. Debs. Red.	100–102	..	4 18 0

WATER COMPANIES.

746,021	Stck.	30 Dec.	10½	Chelsea, Ordinary	330–335	..	3 1 2
150,000	„	„	5	Do. 5 p. c. Pref.	170–175	..	2 17 1
160,000	„	„	4½	Do. 4½ p. c. Pref. Stk., 1875	—	..	—
175,785	„	27 Mar.	4½	Do. 4½ p. c. Deb. Stock	157–162	..	2 15 6
1,719,514	Stck.	15 Apl.	7	East London, Ordinary	245–250	..	2 16 0
654,740	„	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	157–162	..	2 15 6
100,000	„	„	3	Do. 3 p. c. Deb. Stk.	105–107	..	2 16 1
700,000	50	16 Dec.	6½	Grand Junction, 10 p.c. max.	124–128	..	2 10 8
280,000	Stck.	27 Mar.	4	Do. 4 p. c. Deb. Stk.	148–152	..	2 12 8
708,000	Stck.	13 Feb.	12	Kent	338–343	+3	3 10 0
160,000	„	„	7	Do. New, 7 p. c. max.	207–212	..	3 6 0
1,043,800	100	30 Dec.	7½	Lambeth, 10 p. c. max.	275–280	..	2 11 8
406,200	100	„	7½	Do. 7½ p. c. max.	227–232	..	3 2 6
330,000	Stck.	27 Mar.	4	Do. 4 p. c. Deb. Stk.	147–152	..	2 12 8
500,000	100	13 Feb.	12⅞	New River, New Shares	429–434	+2	2 18 9
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk.	153–158	..	2 10 8
902,300	Stck.	16 Dec.	6	S'thwk & V'xhall, Ordinary	167–172	–1	3 9 9
126,500	100	„	6	Do. Do. 7½ p. c. Max.	155–165	..	3 12 9
489,200	Stck.	„	5	Do. Do. 5 p. c. Pref.	168–173	..	2 17 9
1,019,585	„	15 Apl.	4	Do. 4 p. c. A Deb. Stk.	147–152	..	2 12 8
1,155,066	Stck.	16 Dec.	10	West Middlesex	320–325	..	3 1 6
200,000	„	„	4½	Do. 4½ p. c. Deb. Stk.	157–162	..	2 15 6

*Ex div.

† Next dividend will be at this rate.

Cookery Lectures at Farnham.—Mrs. Hunter commenced last Tuesday a series of lectures on cookery in the Town Hall, Farnham; using for the purpose one of Davis's "Metropolitan" gas kitcheners. The course, which was well attended throughout, finished on Friday.

The Leakage of the Redruth Reservoir.—Mr. Nicholls, the Engineer of the new works of water supply for Redruth, recently attended a meeting of the Redruth District Council for the purpose of discussing with the members the cause of the leakage in the new reservoir, and the means to be taken to prevent it. His opinion was that the leakage was due to the nature of the clay used. When the work was commenced, the clay on the site was tested in a small way, and was considered satisfactory. Since the leakage was discovered, he had opened out three places in the reservoir, and found that the work was carried out correctly, but that the nature of the clay was not retentive. The best course would be to face up the sides of the reservoir, to a height of about 5 feet, with concrete or some plastic material, with an apron at the bottom. Then they might turn the water in; and if it retained it, continue the concrete up to 15 feet, when they would have sufficient water in to test the bottom. The 5 feet, including the apron, could be done for £234; and to the overflow level at 15 feet for £600. In answer to a question as to the contractors' liability, Mr. Nicholls said he did not hold them responsible for the nature of the clay; but the work had been delayed longer than was necessary, and difficulty occurred through the clay drying. In the end, Mr. Nicholls was afforded time to submit a written and detailed report.

The Driffield Gas Purchase Question.—In our issue for the 28th ult., reference was made to a communication from the Local Government Board to the Driffield District Council regarding the Provisional Order which they propose to issue, to enable the latter to purchase and carry on the gas undertaking. Upon the letter coming before the Council, the Solicitor (Mr. T. Stephenson) stated that the alterations in the draft Order were very slight; but the most important thing was the intimation that only a short time would be allowed for repaying the loan. The works would have to continue on the present site; but if, at some future time, the Council thought it advisable that the site for manufacturing should be changed, that could be done by obtaining another Order. If the existing site was an unsuitable one, that fact would affect the arbitrators in determining the price to be paid for the works. Mr. White said he considered the letter of more importance than the Order; and he thought that it would be desirable to ask the Local Government Board to raise the maximum price of gas from 4s. 6d. to 5s. 6d. per 1000 cubic feet. The price was now 2s. 11d.; and, if the loan was to be repaid in a short period, and the Council found it impossible to carry on the works without increasing the price very largely, then the extra cost should fall upon the consumers, and not upon the ratepayers. The Chairman proposed that the draft Order, as amended, be approved; and this was agreed to.

Retort-House Machinery for Bolton.—The Gas and Electricity Committee of the Bolton Corporation have accepted the tender of Sir W. Arrol and Co., Limited, for the supply of Arrol-Foulis retort-house machinery for the Gas Street works.

The New Water-Works for Gloucester.—The work in connection with the supplying of Gloucester with water from the new station at Newent is in a forward state. The well-sinking and the headings are practically completed; and the contractors have cleared their plant away so as to enable the builders to proceed with their part of the work. By the erection of a temporary pumping-station away from the well, and when the laying of the pipes is completed, which is expected to be done about the middle of July, a supply will be available. The well is 168 ft. 6 in. deep; and at the depth of 145 feet are two headings 6 feet high and 5 feet wide. With the exception of a short length, a 14-inch main has been laid from Newent to Westgate Bridge, and from St. Nicholas Church to the Cross, where a connection has been made with the 12-inch main from the Witcomb reservoirs. At Upleadon, a covered reservoir has been made, 100 feet long by 60 feet wide, and 18 feet deep, being capable of holding 675,000 gallons of water. This is situated three miles from the well, and eight miles from Gloucester; while it is some 250 feet above sea-level. In the first instance, the water will be pumped into this reservoir, from which it will be run into Gloucester; and it is calculated that it will hold at least a day's supply. The utility of the reservoir will be felt in case of a temporary break-down or a stoppage of the pumping machinery for repairs.

Tarapaca Water-Works Company, Limited.—The eighth annual general meeting of this Company was held on Monday last week, at Winchester House, E.C.—Mr. R. Harvey in the chair. In moving the adoption of the report, which was noticed last week (p. 998), the Chairman said the profit for the year amounted to £52,020, which was sufficient to pay a dividend of 13 per cent. on the capital of the Company. The Directors, however, considered they were acting wisely in only recommending a dividend of 7½ per cent., which was the same as in the previous year. By doing this, they were enabled to carry forward the substantial balance of nearly £20,000, after placing £10,000 to the reserve for the redemption of debentures. They were considering the advisability of acquiring additional springs in the district; and if they did so, the amount carried forward would be used for that object. Debentures amounting to £50,000 would have to be paid off in 1898; and the Directors had in hand £30,000 for the purpose. It was proposed to deduct 10 per cent. from the profits of the current year and a similar percentage for the following year, which would put them in possession of £50,000 to redeem the debentures. After they were paid off, the Directors would be in a position to pay the dividends they formerly declared. The quantity of water sold had been in excess of any previous year. Since 1891, their net earnings had increased from £44,068 to £52,020. The motion was agreed to.

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No.	External Dimensions.			Oven.			Hot Plate.	No. of Boiling-Burners	Price.	White Enamelled Crown extra.
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401	18½	13½	11½	14	11	9½	13½ by 11½	1	28/6	—
402	24½	15½	15	18	11	11	15½ ,, 15	2	40/-	2/6
403	30	18	17	19	11	11	18 ,, 17	2	45/-	2/6
404	30	18	17	19	13½	11	18 ,, 17	2	50/-	2/6
404	If fitted with Enamelled-Lined and Jacketted Door and Fire-Brick Crown, as adopted by The London Gaslight and Coke Co.								55/-	2/6

Any of these Cookers, except No. 401, can be fitted with Griller at an extra charge of 2/6; but the adoption of the Griller is not recommended for use with Prepayment Meters.

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Reduction in Price.—The Directors of the Dorking Gas Company announce a further reduction of 2d. per 1000 cubic feet in the price of gas as from the inspection of meters in June. This, with the usual discount for prompt payment, will reduce the net price to 3s. 7d. per 1000 cubic feet.

Sales of Shares.—Last Wednesday, ten £10 shares in the Ashford Gas Company were sold by auction. Five realized £21 10s. each; four, £21 5s. each; and one, £21. Eight £5 shares in the same Company, on each of which £3 had been paid, went at an average of £7 2s. 6d. a piece.——At Exmouth, last Tuesday, 150 preference shares (5 per cent.) in the Exmouth Gas Company were offered for sale by Messrs. Crews and Son. The shares (£10) were offered in lots of five; and they realized from £13 10s. to £13 12s. 6d. each.

The Assessment of the Cheltenham Corporation Water-Works Property.—The Assessment Committee of the Cheltenham Union have given notice to the Town Council that the rateable value to the poor rate of the water-works property in Cheltenham, Charlton Kings, and Leckhampton has been raised as follows: Cheltenham, from £2963 to £4500; Charlton Kings, from £2010 to £2500; Leckhampton, from £232 5s. to £300; and Prestbury, from £56 to £100; being a total addition in Cheltenham Union of £2139. The Assessment Committee of Tewkesbury Union have also given notice that the rateable value to the poor rate of the water-works in Ashchurch has been set down in the valuation list at £200. The Council have resolved to appeal against these amounts.

The Introduction of Water-Gas Plant at Birkenhead.—The question of the introduction of water-gas plant at Birkenhead (noticed last week) was mentioned by Alderman Bloor, in moving the confirmation of the proceedings of the Gas Committee at the meeting of the Town Council on Wednesday. He said the Sub-Committee who had considered the matter had unanimously arrived at the decision to erect plant for the manufacture of carburetted water gas, and that decision had been accepted by the General Committee. If the Council declined to agree to their recommendation, they did so with the knowledge that they were going against the advice of the authority charged with the responsibility of providing gas. Their Gas Engineer thoroughly approved of the scheme. The minutes were confirmed. [We understand that the system proposed to be adopted is that of the Economical Gas Apparatus Construction Company, Limited.]

Singapore Gas Company, Limited.—The accounts of this Company for the half year ending Dec. 31 last show an improvement over those of the preceding six months. This is chiefly due to the more favourable rate of exchange and the better carbonizing results. There has been an increased return from the sales of products and fittings; and the business of the Company has been fairly satisfactory. In consequence of the resignation of the Manager (Mr. H. W. Smith), the Directors have appointed Mr. Albert Ford, late Manager of the gas and water works of the City of Santos Improvements Company, Limited; and he has taken over the management from the end of March. Mr. Smith is now returning; and the Directors hope he will be present at the annual meeting. The balance for appropriation, after several writings off, amounts to £1687. Out of this sum, the Directors recommend the declaration of a dividend at the rate of 3 per cent. per annum, free of income-tax, carrying forward a balance of £723.

The Thames Conservators and the Pollution of the River.—As already mentioned in the "JOURNAL," notices have been served by the Thames Conservators upon various local authorities, calling upon them to discontinue within three months the discharge of polluting matter into all streams under their control which are themselves tributaries, or in communication with tributaries, of the river. The Hartley Wintney District Council have lately been summoned for failing to comply with the notice; and a curious point arose in the course of the proceedings. The polluting matter was discharged into a running ditch, which, after traversing nearly 2½ miles, entered into a relief stream of the Whitewater, passed into the Blackwater, from that into the Loddon, and thence into the Thames. Considerable discussion ensued as to whether a ditch so far removed, and having three rivers intercepting any water therefrom, could be legally called a "tributary" of the Thames. Samples of water taken from the ditch, which flowed from a gas-works, were found to contain a large amount of ammonia and easily decomposable nitrogenous organic matter; and altogether the effluent was very bad. It was decided that the ditch was a tributary of the river as defined by section 90 of the Thames Conservancy Act, 1894; and the case was adjourned for six months to give the District Council an opportunity of dealing with the trouble. If at the end of that time they find it necessary to ask for a further extension, the Court will be prepared to grant it.

New Water-Works in Surrey.—The work in connection with the construction of a new reservoir for the Farnham Water Company was commenced last Tuesday. The contract has been entrusted to Mr. W. Coker, of Rochester, who has just completed works for the Frimley and Farnborough Water Company.

The Water Supply of Plymstock.—The Plympton District Council have adopted the scheme of Mr. Francis, to which reference was made in the "JOURNAL" last week, for the supply of water to Plymstock, from a source in Plympton. The decision was communicated to the Plymstock Parish Council; and a resolution approving it was carried by a majority, against the protest of a number of members who still insisted that there was a sufficient supply of water in the parish.

Opening of a New Reservoir for Bury.—The members of the Bury Corporation last Thursday visited Bacup to formally inaugurate a new reservoir in the Water Valley. Parliamentary powers were obtained to construct the reservoir in 1889; and the works were commenced in 1891. The top water has an area of 32 acres, at an elevation of 1010 feet above sea-level; and the total capacity is 202 million gallons. The natural gathering-ground is 421 acres in extent, and is augmented by a catchwater gathering-ground of 315 acres—making in all 736 acres. The compensation supply is 540,000 gallons per day. In addition to this, the reservoir is capable of giving a supply of 25 gallons per head to a population of 30,000 for 157 days, if no rain falls during that period. The main embankment covers an area of 30,170 square yards, and is 1172 feet long, 76 feet high, 20 feet on the top, and 470 feet at its greatest width. The tunnel through the embankment is 496 feet long and 5 ft. 6 in. diameter. The cost, exclusive of the land, has been £77,500; and with the land, about £100,000. The Borough Engineer (Mr. Cartwright) designed and carried out the works.

Withdrawal of Opposition to the Bexhill Gas Bill.—At a special meeting of the Bexhill District Council last Tuesday, Earl Delawarr presiding, the position of the Council with respect to their opposition to the Bill of the Bexhill Gas and Water Company was considered. A member suggested that Earl Delawarr, who is a Director of the Company, should retire. But the Chairman said he was a large ratepayer, and not likely to sacrifice the interests of the town for those of the Company; and he declined to vacate the chair. He then read a letter from the Local Government Board, stating that the recent poll of the ratepayers had not been taken in accordance with the Act of Parliament. The Parliamentary Agents also wrote that they had reason to alter their opinion; and they did not now think the Council would be able to secure the insertion in the Bill of a compulsory purchase clause. As certain proposals had been accepted by the Company, they suggested that the opposition should not be proceeded with. It was resolved to take the Parliamentary Agents' advice. A question arose as to how the expenses already incurred were to be met. The Clerk to the Council stated that, though the Local Government Board said that such a course could not be sanctioned, he had Counsel's opinion to the effect that the expenses could be defrayed out of the rates.

South African Lighting Association, Limited.—The Directors of this Association, in their report for 1895, state that they have to record another year's satisfactory working. The sale of gas at Port Elizabeth shows a small decrease by comparison with 1894, due to the introduction by the Association of incandescent burners. The Directors, however, regard this fact with satisfaction, as they consider that, by means of this new system of lighting, gas has gained in popularity compared with other illuminants. The works at Grahamstown have also added to the balance of net revenue for the past year. The renewals and extensions at Port Elizabeth, referred to in the last report, have been partly carried out; and the whole cost of these, as at present completed, has been charged to the depreciation account. During the past year the share capital has been raised to £41,000, and the debentures now stand at £20,000, an issue of £7000 more having been made in May last. The Company's Manager at Port Elizabeth has lately paid a visit to England; and the Directors have also been able to confer with Mr. H. Woodall, who has now returned home. Both of these gentlemen report favourably on the future prospects of the Association, and the improved condition of the works. The balance of net revenue for the year is £8093, which is £814 more than in 1894. After deducting interest on debentures and other expenses as set out in the profit and loss account, and transferring £1500 to the reserve account, there remains, after allowing for the interim dividend paid in October last, an available balance of £6711. The Directors recommend that this should be dealt with by the transfer to plant depreciation account of £1000, and the payment of a dividend of 8 per cent. and a bonus of 2 per cent. for the year, from which will be deducted the interim dividend above referred to. This leaves £2642 to carry forward.

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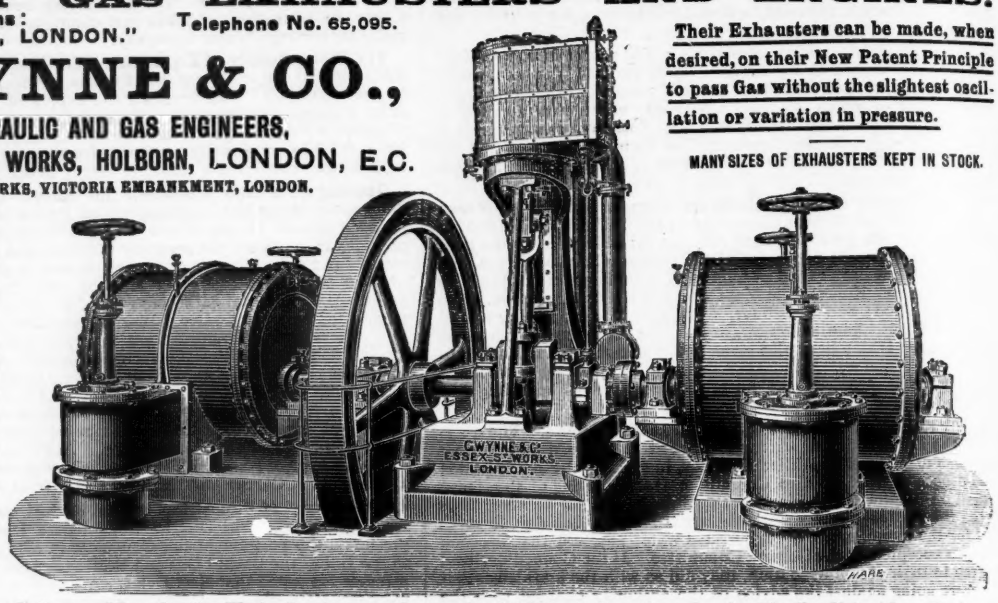

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Address the MANAGER, Gas-Works, Sandown, ISLE OF WIGHT.

GAS PLANT FOR SALE.

FOUR Purifiers, 10 feet square by 4 feet deep, complete with 10-inch Centre-Valve and Connecting-Pipes and Lifting Apparatus (replaced by larger Purifiers); Cutler's patent CONDENSER, with 6-inch Connections and Four-Way Valve; GAS REFEREES' CUBIC FOOT MEASURE.
All the above in good working order.
For further Particulars apply to G. W. LUPTON, Gas-Works, Otley, near LEEDS.

COUNTY BOROUGH OF OLDHAM.

THE Gas-Works Committee are prepared to receive TENDERS for the supply of about 103,000 Tons of CANNEL and COAL required by them during the Year ending the 30th of June, 1897.
Specifications and Forms of Tender can be obtained on application to Mr. Arthur Andrew, Gas and Water Offices, Oldham, to whom tenders are to be sent on or before Tuesday, the 26th inst.
A. NICHOLSON,
Town Clerk.
May 9, 1896.

ILKLEY URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee of the Ilkley Urban District Council invite TENDERS for the supply of 5500 Tons of best screened GAS COAL, to be delivered at Ilkley Station during the next Twelve Months ending June 30, 1897, in such quantities monthly as may be required.
Sealed tenders, addressed to the Chairman of the Gas Committee, endorsed "Tender for Coal," must be delivered not later than Thursday, the 21st day of May, 1896.
The lowest or any tender not necessarily accepted.
By order,
W. EVERITT,
Manager.

ILKLEY URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee of the Ilkley Urban District Council invite TENDERS for the purchase of the surplus TAR produced at their Works (about 300 Tons) during the next Twelve Months ending June 30, 1897.
Sealed tenders, addressed to the Chairman of the Gas Committee, endorsed "Tender for Tar," must be delivered not later than Thursday, the 21st day of May, 1896.
The highest or any tender not necessarily accepted.
By order,
W. EVERITT,
Manager.

THE Corporation of the City of Bangor are prepared to receive TENDERS for the GAS COAL required at their Gas-Works during the ensuing Year, in such quantities and at such times as may be required (in all 4000 Tons) from the 1st of September, 1896, to the 31st of August, 1897.
The person whose tender is accepted will be required to enter into an Agreement with the Council for the due performance of his contract.
The lowest or any tender not necessarily accepted. The Council also reserve the right to divide the contract between two or more Contractors.
Further Information and Forms on which the tenders must be made may be obtained on application to me.
Tenders sealed to be sent to me on or before the 21st inst.
JOHN SMITH,
Manager.
Gas-Works, Bangor,
May 6, 1896.

CORPORATION OF BLACKPOOL.

THE Gas Committee are prepared to receive TENDERS for the supply of COAL during the next Twelve Months.
Forms of Tender may be had from the undersigned, and must be sent in, addressed to the Chairman, and endorsed outside "Tender for Coal," by Saturday, May 23.
(Signed) JOHN CHEW,
Gas Engineer.
Gas Office, Blackpool,
May 8, 1896.

GLASGOW CORPORATION GAS.

TENDERS FOR METERS.

THE Corporation of Glasgow invite TENDERS for the supply of such DRY METERS as they may require for Twelve Months from the 1st of July next.
Forms of Tender may be had on application to the Manager at the Gas Office, 45, John Street, Glasgow; and sealed Offers, marked "Tender for Meters," to be addressed to, and lodged with, the Subscriber on or before Tuesday, the 26th current.
The Corporation do not bind themselves to accept the lowest or any offer.
J. D. MARWICK,
Town Clerk.
City Chambers, Glasgow,
May 6, 1896.

BOROUGH OF BRIGHOUSE.

TENDERS FOR GAS COAL, CANNEL, AND LIME.

THE Gas Committee are prepared to receive TENDERS for the supply and delivery of GAS COAL and CANNEL and BUXTON LIME required at the Mill Lane and Birds Royd Gas-Works during the Year ending the 30th of June, 1897.
Specification and Form of Tender can be obtained on application at the Gas Engineer's Office, Public Offices, Brighouse.
Sealed tenders, stating price per ton delivered at the Gas-Works, or alongside the Gas-Works, by the Calder and Hebble Canal, or at Brighouse Railway Station, must be sent in on or before Monday, the 18th day of May, 1896, addressed to the Town Clerk, Public Offices, Brighouse, endorsed on the outside "Tender for Coal," or "Lime," as the case may be.
The lowest or any tender not necessarily accepted.
By order,
JAMES PARKINSON,
Town Clerk.
Town Clerk's Office, Brighouse,
April 28, 1896.

BRIGHOUSE CORPORATION.

TO MANUFACTURING CHEMISTS AND OTHERS.

THE Gas Committee of the Brighouse Corporation are prepared to receive TENDERS for the purchase of the surplus TAR and the LIQUOR produced at their Gas-Works for a term of One, Two, or Three Years from the 25th of March.
The Tar and Liquor can be loaded into Contractors' Carts on the Works, or into Barges on the Calder and Hebble Canal (which runs alongside) by Pipe direct from the Works.
Any further Particulars can be obtained on application to the Gas Engineer.
Sealed tenders, endorsed on the outside "Tender for Tar," or "Liquor," as the case may be, stating price per ton at the Gas-Works, must be sent on or before Monday, the 18th day of May, 1896, addressed to the Town Clerk, Public Offices, Brighouse.
The Committee do not bind themselves to accept the highest or any tender.
By order,
JAMES PARKINSON,
Town Clerk.
Town Clerk's Office, Brighouse
April 28, 1896.

BOROUGH OF BRIGHOUSE.

TO MAIN LAYERS.

THE Water Committee of the Brighouse Corporation are prepared to receive TENDERS for the LABOUR only for DIGGING and LAYING about 1540 yards of 8-inch and 2315 yards of 6-inch CAST-IRON WATER-MAINS.
Specification and Form of Tender may be obtained on application at the Public Offices, Brighouse.
Sealed tenders, endorsed on the outside "Main Laying," are to be sent in on or before Wednesday, the 20th day of May, 1896, addressed to the Town Clerk, Public Offices, Brighouse.
The lowest or any tender not necessarily accepted.
JAMES PARKINSON,
Town Clerk.
Town Clerk's Office, Brighouse,
May 6, 1896.

BOROUGH OF BRIGHOUSE.

TO IRONFOUNDERS.

THE Water Committee of the Corpora- tion are prepared to receive TENDERS for the supply and delivery, carriage paid, at Brighouse Railway Station, or Calder and Hebble Canal Wharf, of a quantity of CAST-IRON WATER-MAINS and SPECIAL PIPES.
Approximate quantity—
1540 yards, 8 inches diameter, SOCKET AND SPIGOT PIPE.
2315 yards, 6 inches diameter, SOCKET AND SPIGOT PIPE.
The SPECIAL PIPES are TEES, BRANCHES, ELBOWS, &c.
Further Particulars and Form of Tender can be obtained on application to the undersigned.
Sealed tenders, endorsed on the outside "Water-Mains," are to be sent in, addressed to the Town Clerk, Public Offices, Brighouse, on or before Wednesday, the 20th day of May, 1896.
The lowest or any tender not necessarily accepted.
JAMES PARKINSON,
Town Clerk.
Town Clerk's Office, Brighouse,
May 6, 1896.

CORPORATION OF MANCHESTER.

TENDERS FOR COAL AND CANNEL.

THE Gas Committee are prepared to receive, on or before Wednesday, the 3rd of June next, OFFERS of high-class CANNELS and COALS suitable for Gas Making, for delivery at their Gaythorn, Rochdale Road, and Bradford Road Works, during a period of One, Two, or Three Years, commencing the 1st of July, 1896.
Particulars and printed Forms of Tender may be obtained on application (in writing only) to Mr. Charles Nickson, Superintendent, Gas Department, Town Hall, Manchester.
By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.
Town Hall, Manchester,
May 1, 1896.

MANCHESTER CORPORATION GAS-WORKS.

SPENT OXIDE.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the purchase and removal of the SPENT OXIDE to be produced at their Gaythorn, Rochdale Road, and Bradford Road Works during a period of One, Two, or Three Years from the 30th of June next.
The Committee do not bind themselves to accept the highest or any tender.
Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Spent Oxide," must be delivered at the Offices of the Gas Department, Town Hall, not later than Ten a.m., on Wednesday, the 10th of June next.
Forms of Tender and further Particulars may be obtained on application in writing to Mr. Charles Nickson, Superintendent of the Gas Department.
By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.
Town Hall, Manchester,
May 7, 1896.

MANCHESTER CORPORATION GAS-WORKS.

AMMONIACAL LIQUOR.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the purchase and removal of the AMMONIACAL LIQUOR to be produced at the Gaythorn, Rochdale Road, and Bradford Road Gas-Works during a period of One or more Years, commencing at noon on the 30th day of June, 1896.
The Committee do not bind themselves to accept the highest or any tender.
Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Ammoniacal Liquor," must be delivered at the Offices of the Gas Department, Town Hall, on or before Wednesday, the 10th of June, 1896.
Forms of Tender and further Particulars may be obtained on application, in writing only, to Mr. Charles Nickson, Superintendent of the Department.
A deposit of One Guinea (which will be returned on receipt of the tender) must accompany each application for a tender form.
By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.
Town Hall, Manchester,
May 7, 1896.

COUNTY BOROUGH OF STOCKPORT.
(GAS DEPARTMENT.)

WATER-GAS PLANT.

THE Gas Committee are prepared to receive TENDERS for the supply and erection complete (exclusive of Buildings) of a WATER-GAS PLANT, at their Portwood Works.
The Site may be inspected, and all Information obtained, on application to the Engineer, to whom intending Contractors will be required to send, not later than May 28 next ensuing, Drawings and full Detailed Specifications of the Plant they propose to supply; but such Specification must not contain any Price thereon.
Tenders, to be addressed to the Chairman of the Gas Committee, Gas Department, Stockport, and endorsed "Water-Gas Plant," must be sent in not later than Three p.m. on the 4th day of June next ensuing.
The Committee do not bind themselves to accept the lowest or any tender.
By order,
WALTER HYDE,
Town Clerk.
Stockport, May 8, 1896.

COUNTY BOROUGH OF STOCKPORT.
(GAS DEPARTMENT.)

TO IRONFOUNDERS AND GAS ENGINEERS.

THE Gas Committee invite Tenders for the following:—
CONTRACT No. 1—Two PURIFIER-COVERS for their Portwood Station.
CONTRACT No. 2—IRON FLOOR PLATES, COLUMNS, and other IRONWORK required in a further Extension of the Retort-House at Portwood Works.
Copies of Drawings and Specifications can be obtained by application to the Engineer, and on payment of 10s. 6d., which is not returnable.
Tenders, together with quantities fully priced out, must be sent on or before Twelve o'clock Noon of May 21 next ensuing, addressed to the Chairman of the Gas Committee, Gas Department, Stockport, and endorsed "Contract No. 1" or "No. 2," as the case may be.
Quantities will be returned to those who are not successful.
The Resolution of the Council that Contractors will be expected to pay the average Rate of Wages paid in the district will apply to these Contracts; and the Committee do not bind themselves to accept the lowest or any tender.
By order,
WALTER HYDE,
Town Clerk.
Stockport, May 8, 1896.

THE Directors of the Petworth Coal Gas and Coke Company invite TENDERS for the supply of 850 Tons of good GAS COAL, to be delivered free at Petworth Station (L., B., & S. C. Railway), when required, between July, 1896, and July, 1897.

Sealed tenders, endorsed "Coal," to be sent to the Secretary on or before May 25, 1896.

The Directors do not bind themselves to accept the lowest or any tender.

No tender form supplied.

C. H. DOWNS,
Secretary.

Petworth, May 11, 1896.

THE URBAN DISTRICT COUNCIL OF LYMM.

THE above Council invite Tenders for the supply and delivery of 600 yards of 6-inch CAST-IRON MAINS; also sundry SPECIALS.

Sealed tenders, stating price per ton for Pipes and Specials, to be sent to Wm. Mullard, Esq., Clerk to the Council, on or before the 20th of May, 1896, endorsed "Pipes."

The Council do not bind themselves to accept the lowest or any tender.

Further Particulars may be had on application to

WILLIAM SEVERS,
Gas Manager.

Lymm, Cheshire,
May 2, 1896.

THE URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Gas-Works, for a term of One Year from the 1st day of July, 1896.

The Tar and Liquor will be delivered free into Contractor's Boat on the Bridgewater Canal.

The Purchaser will have to enter into an Agreement with the Council for the due performance of his Contract.

Sealed tenders, stating price per ton for Tar and price per ton for Liquor (5° Twaddel), to be sent to Wm. Mullard, Esq., Clerk to the Council, on or before the 20th day of May, 1896, endorsed "Tar."

The Council do not bind themselves to accept the highest or any tender.

Further Particulars may be had on application to

WILLIAM SEVERS,
Gas Manager.

Lymm, Cheshire,
May 2, 1896.

THE URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to receive TENDERS for the supply of GAS COAL and CANNEL, to be delivered at their Gas-Works in Lymm, for a term of One Year from the 1st day of July, 1896.

The probable quantities required are about 1200 Tons of Gas Coal, and 250 Tons of Cannel, which must be freshly wrought, and well screened, and free from Sulphurous Pyrites or other objectionable matter; but the Council reserve the right of increasing or decreasing the quantities named.

The person whose tender is accepted will be required to enter into an Agreement with the Council for the due performance of his Contract.

Sealed tenders, stating price per ton delivered alongside the Works, to be sent to Wm. Mullard, Esq., Clerk to the Council, on or before the 20th day of May 1896, endorsed "Coal and Cannel."

The Council have no special Form of Tender, and do not bind themselves to accept the lowest or any tender.

Further Particulars may be had on application to

WILLIAM SEVERS,
Gas Manager.

Lymm, Cheshire,
May 2, 1896.

HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD.

TENDERS FOR COAL AND CANNEL.

THE Gas Board invite Tenders for the supply of 5000 Tons of GAS COAL and 700 Tons of CANNEL COAL, to be supplied in such quantities as may be determined by the Board during the Year ending the 30th of June, 1897.

Forms of Tender and further Information may be had on application to Mr. R. West, Manager, Gas-Works, Hebden Bridge.

Tenders, endorsed "Tender for Coal," must be addressed to E. J. Crossley, Esq., Chairman of the Gas Board, Crow Nest, Hebden Bridge, and sent in not later than the 25th of May, 1896.

The Board do not bind themselves to accept the lowest or any tender.

RICHARD CRABTREE,
Clerk to the Gas Board.

Crow Nest, Hebden Bridge,
April 30, 1896.

HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD.

THE Gas Board invite Tenders for the Works required in the Construction and Erection of two 25 ft. by 15 ft. PURIFIERS on Steel Staging; One GASHOLDER, 50 ft. by 12 ft.; CONDENSER, capacity 200,000 cubic feet per diem; and the REMOVAL and RE-FIXING of sundry Apparatus, Pipes, and Connections, &c., at the Gas-Works, Hebden Bridge.

The Specifications and Drawings may be seen on application to Mr. R. West at the Gas-Works, Hebden Bridge, from whom Specifications and Quantities may be had on payment of Half a Guinea, which will be returned on receipt of *bond-fide* tenders.

Tenders must be addressed to E. J. Crossley, Esq., Chairman of the Gas Board, at the Office, Crow Nest, Hebden Bridge, and endorsed "No. 2 Contract," and sent in not later than Tuesday, the 19th of May, 1896.

The Board do not bind themselves to accept the lowest or any tender.

RICHARD CRABTREE,
Clerk to the Gas Board.

Crow Nest, Hebden Bridge,
April 30, 1896.

CITY OF LEEDS.
(GAS DEPARTMENT.)

TENDERS required as below—

For CRAVEN or DERBYSHIRE LIME.
For WROUGHT-IRON TUBES.
For Pressed and Common Red BRICKS.

Forms of Tender may be obtained on application to the undersigned.

Endorsed tenders, addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, will be received not later than Wednesday, the 20th inst.

The Committee do not bind themselves to accept the lowest or any tender.

R. H. TOWNSLEY,
General Superintendent.

Municipal Buildings, Leeds,
May 2, 1896.

CITY OF LEEDS.
(GAS DEPARTMENT.)

THE Gas Committee of the Leeds City Council are prepared to receive TENDERS for the purchase of a number of Old WET and DRY GAS-METERS and a quantity of Old BRASS, now lying at the Stores Department, 21, Dewsbury Road, Leeds, where the same can be inspected.

Forms of Tender for the old Meters may be obtained on application to the undersigned.

Endorsed tenders, addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, will be received not later than Wednesday, the 20th inst.

R. H. TOWNSLEY,
General Superintendent.

Municipal Offices, Leeds,
May 2, 1896.

CITY OF LEEDS.
(GAS DEPARTMENT.)

TENDERS FOR GASHOLDER PAINT.

THE Gas Committee of the Leeds City Council are prepared to receive TENDERS for the supply of good OXIDE PAINT, suitable for Painting Gasholders.

Sample tins, containing not more than 5 lbs., mixed ready for use (Colours, drab and dark red), to be sent to the undersigned not later than Saturday, the 16th inst., and price per hundredweight to be quoted delivered at the Stores, 21, Dewsbury Road, Leeds.

Tenders, addressed to the Chairman of the Gas Committee, Municipal Offices, Leeds, will be received not later than Wednesday, the 20th inst., and endorsed "Tender for Gasholder Paint."

R. H. TOWNSLEY,
General Superintendent.

Municipal Offices, Leeds,
May 2, 1896.

CITY OF LEEDS.
(GAS DEPARTMENT.)

THE Gas Committee of the Leeds City Council are prepared to receive TENDERS for the construction and erection of four lengths of STEEL HYDRAULIC MAINS, ARCH-PIPES, &c., for the York Street Gas-Works.

Plans can be seen, and Specification and Bills of Quantities obtained from the undersigned.

Tenders, endorsed "Hydraulic Mains," and addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, will be received not later than Saturday, the 16th inst.

The Committee do not bind themselves to accept the lowest or any tender.

R. H. TOWNSLEY,
General Superintendent.

Municipal Buildings, Leeds,
May 4, 1896.

LURGAN GASLIGHT AND CHEMICAL COMPANY, LIMITED.

COAL WANTED.

THE Directors invite Tenders for the supply of 2750 Tons of best (screened) GAS COAL, delivered into Lighters, *ex*-ship at Belfast, free of all Charges.

Delivery of 2500 Tons will be taken before the 1st of November next; the remainder to be delivered at such times before the 1st of April, 1897, as may be required. Vessels carrying from 200 to 300 Tons can at once deliver into Lighters, and these Lighters be back for a further Cargo within a period to be arranged and agreed upon by the Gas Company.

Tenders (in sealed envelope), accompanied by reference to Gas-Works using the Coal offered, should reach me not later than Eleven o'clock in the forenoon of Friday, the 29th of May, 1896.

The Directors do not bind themselves to accept the lowest or any tender.

FRED W. MAGAHAN,
Secretary.

Gas-Works, Lurgan,
May 4, 1896.

HINCKLEY URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

COAL, COKE, TAR, LIME, AND SULPHURIC ACID CONTRACTS.

THE Gas Committee of the Hinckley Urban District Council invite TENDERS as follows—

COAL—For the supply of Gas Coal, about 5000 Tons, for the Year ending June 30, 1897.

COKE—For the purchase of all surplus Coke during the Year ending June 30, 1897.

TAR—For the purchase of all surplus Tar produced during the Year ending June 30, 1897.

LIME—For the supply of all the Lime required for Purification Purposes (about 200 Tons) during the Year ending June 30, 1897.

SULPHURIC ACID—For the supply of about 60 Tons for Sulphate of Ammonia Manufacture during the Year ending June 30, 1897.

Sealed and endorsed tenders to be sent to the undersigned on or before mid-day Monday, May 18 inst.

Forms of Tender and further Particulars from

G. HELPS,
Engineer and Manager.

THE Widnes Corporation invite Tenders for the supply of about 18,000 Tons of GAS COAL (Slack, "Through and Through," or Screened Coal) for the period ending the 30th of June, 1897, to be delivered at the Gas-Works, Widnes.

Conditions and Forms of Tender may be obtained from Mr. I. Carr, Assoc.M.Inst.C.E., Gas Engineer, Widnes.

Tenders, endorsed "Gas Coal," to be delivered to the undersigned, on or before the 21st of May inst.

The lowest or any tender not necessarily accepted.

H. S. OPPENHEIM,
Town Clerk.

Town Hall, Widnes,
May 6, 1896.

TENDERS FOR GAS COAL.

THE Corporation of Droitwich invite TENDERS for the supply of from 1100 to 1300 Tons of best screened GAS COAL, to be delivered free at Droitwich (G.W.) Railway Station, at such times and in such quantities as may be required, prior to the 31st of May, 1897.

Particulars and Form of Tender may be obtained on application to the Manager of the Gas-Works.

Sealed tenders, on the form provided for the purpose (with the Analysis of the Coal to be supplied), endorsed "Tender for Gas Coal," to be sent to the undersigned on or before the 21st of May inst.

The Corporation do not bind themselves to accept the lowest or any tender.

S. JOHN TOMBS,
Town Clerk.

Droitwich, May 1, 1896

LONGWOOD GAS COMPANY.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the above Company are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Works during the Year ending June 30, 1897.

Price per ton for Liquor per degree at 5° and 6° Twaddel.

The estimated quantity for disposal is about 1000 Tons.

Tenders, sealed and endorsed, to be sent in not later than Thursday morning, May 21, addressed to Edward Armitage, Esq., J.P., Chairman, Longwood Gas Company, Huddersfield.

By order,

JOHN L. MITTON,
Manager and Secretary.

LINCOLN CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR TAR.

THE Gas Committee of the Corporation of Lincoln are prepared to receive TENDERS for the purchase of the surplus TAR (about 800 Tons) produced at their Works during the period of One Year, commencing on the 1st of July, 1896.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Residuals," must be delivered at the Gas Offices, Lincoln, on or before the 25th inst.

The Committee do not bind themselves to accept the highest or any tender.

Other Particulars may be obtained of the undersigned,

JNO. CARTER,
Manager.

Gas-Works, Lincoln,
May 6, 1896.

LLANDUDNO URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL.

THE Llandudno Urban District Council invite TENDERS for the supply of 5000 Tons of best screened GAS COAL, NUTS, and PEAS, capable of producing a minimum of 9500 cubic feet of 17-candle Gas per ton, to be delivered, carriage paid, between the 1st of July, 1896, and the 30th of June, 1897, at the Llandudno Station of the London and North-Western Railway, in such quantities and at such periods as may be ordered from time to time.

Tenders, endorsed "Tender for Coal," specifying the description of Coal, the name of the Pit, and the particular Seam from which the Coal is to be supplied, to be sent to the undersigned not later than the 28th day of May, 1896.

Forms of Tender may be obtained on application to the undersigned; and only such tenders as are upon the prescribed form will be considered.

The Council do not bind themselves to accept the lowest or any tender.

A. CONOLLY,
Clerk to the Council.

MANSFIELD CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL AND CANNEL.
TENDERS FOR TAR AND AMMONIACAL LIQUOR.

COALS—The Gas Committee are pre- pared to receive TENDERS for 1500 Tons of CANNEL and 6000 Tons of best screened GAS COAL, delivered at Mansfield Station for One Year from June 1, 1896, to May 31, 1897.

TAR AND LIQUOR—TENDERS for TAR and LIQUOR made during the Year from July 1, 1896, to June 30, 1897. Tenders for Liquor to be made either at a fixed price per ton, or on the Sliding-Scale regulated by the price of Sulphate.

Tenders, endorsed, to be sent to J. Harrop White, Esq., Deputy Town Clerk, Mansfield, on or before May 26, 1896.

Particulars and all other Information from the undersigned.

No Special Forms of Tender provided.

The Committee reserve the right to accept the lowest or any tender.

ARTHUR GRAHAM,
Engineer and Manager.

Gas-Works, Mansfield,
May 7, 1896.

BOROUGH OF CHORLEY.

TO RETORT MANUFACTURERS.

THE Corporation of Chorley are pre-pared to receive TENDERS for the supply of 23 FIRE-CLAY RETORTS (18 Ω-shaped and 4 Ovals), 10 ft. by 20 in. by 15 in.

Tenders, endorsed "Retorts," may be sent to the undersigned on or before Tuesday, the 19th inst.

By order,
JNO. MILLS,
Town Clerk.

Town Hall, Chorley,
May 7, 1896.

COUNTY BOROUGH OF BURNLEY.

TENDERS FOR PURIFIERS.

THE Gas Committee of the Corporation of Burnley are prepared to receive TENDERS for the supply and erection of four PURIFIERS, 30 feet square, with Iron Roof over same.

Drawings may be seen, and Specification with Bill of Quantities and Form of Tender obtained, on application to the undersigned, on payment of 10s. 6d., which will be returned on receipt of *bonâ-fide* tender.

Tenders, under seal, endorsed "Tender for Purifiers," and addressed to the Chairman of the Gas Committee, Town Clerk's Office, Town Hall, Burnley, to be delivered not later than Wednesday, the 20th of May, 1896.

JNO. P. LEATHER,
Gas Engineer.

Gas-Works, Burnley,
May 1, 1896.

BOROUGH OF BURTON-UPON-TRENT.

TO COLLIERY PROPRIETORS.

THE Mayor, Aldermen, and Burgesses of the Borough of Burton-upon-Trent, acting by the Council, are prepared to receive TENDERS from Colliery Proprietors for the supply of 25,000 Tons, or a portion thereof, of best screened GAS COAL.

Forms of Tender and Conditions of Supply may be obtained upon application at my Office; and sealed tenders, endorsed "Coal," are to be delivered to me at or before Ten a.m. on the 27th day of May inst.

The Council do not bind themselves to accept the lowest or any tender.

F. L. RAMSDEN,
Manager and Engineer.

Gas and Electric Light Works,
Wetmore Road, Burton-upon-Trent,
May 13, 1896.

TIPTON GAS-WORKS.

TAR CONTRACT.

THE Gas Committee of the Tipton Urban District Council invite TENDERS for the purchase of the surplus TAR produced at the above Works, during a period of One, Two, or Three Years, from the 1st of July next.

Particulars may be obtained at the Gas-Works on application to Mr. Vincent Hughes, the Engineer and Manager.

The Tar may be delivered either into Boats or on Rail (L. & N.W. Railway) as may be required.

Sealed and endorsed tenders to be sent to me the undersigned not later than Ten a.m. on Friday, the 15th inst.

The Committee do not bind themselves to accept the highest or any tender.

By order,
GEO. M. WARING.
Clerk to the Council.

Public Offices, Tipton,
May 1, 1896.

STOKE-UPON-TRENT CORPORATION GAS-WORKS.

THE Gas Committee of the Corporation of Stoke-upon-Trent are prepared to receive TENDERS for their further EXTENSIONS at the Gas-Works, Wharf Street, as under, viz.—

Contract No. 2.—For two STEEL LANCASHIRE BOILERS, 18 feet in length by 6 feet diameter, with all necessary Fittings, Brickwork, &c. Contractors to furnish Specification and Tracings with tender.

Contract No. 3.—For the erection of new ENGINE ROOM, GENERAL WORKSHOPS, &c. Plans and Specifications and General Conditions may be seen on application to Mr. Wm. Prince, Engineer and Manager.

Sealed and properly endorsed tenders to be sent in addressed Mr. Councillor Frederick Geen, Chairman, Gas-Works, Stoke-upon-Trent, on or before Twelve o'clock, Thursday, the 14th day of May, 1896.

The lowest or any tender not necessarily accepted.

By order,
J. B. ASHWELL,
Town Clerk.

Stoke-upon-Trent,
May 1, 1896.

IMPORTANT SALE OF CHICHESTER GAS COMPANY'S SHARES.

TO BE SOLD, by Auction, by Messrs. WYATT AND SON, on Wednesday, the 20th of May, 1896, at the Dolphin Hotel, Chichester, at Three o'clock precisely, in 50 Lots, by order of the Directors of the City of Chichester Gas Company, FIVE HUNDRED £10 SHARES in the above Company, being the first portion of the Additional Capital authorized to be raised by the Chichester Gas Order, 1881. The Maximum Dividend authorized is 7 per cent.

Printed Particulars, with Conditions of Sale and full Information, may be obtained of Messrs. RAPER, FREELAND, and TYACKE, Solicitors, West Street, CHICHESTER; of ALFRED LASS, Esq., 30, Gracechurch Street, LONDON, E.C.; R. S. CHURCH, Esq., Secretary at the Company's Offices, the Gas-Works, CHICHESTER; and of Messrs. WYATT AND SON, Auctioneers and Valuers, East Street, CHICHESTER, HAVANT, and ARUNDEL.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Powers.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

Gas and Water Stocks and Shares of the Capital Value of upwards of £15,000 brought into the Market by order of Executors, and

TO BE SOLD BY AUCTION BY

MR. ALFRED RICHARDS at the Mart, Tokenhouse Yard, London, E.C., on Monday, June 15, 1896, at Two o'clock precisely, in Lots.

The Stocks and Shares are in the following Undertakings:—

- Crystal Palace District Gas Company, £2412 5 per cent. Stock.
- Barnet District Gas and Water Company, £1305 Stock.
- Hastings and St. Leonards Gas Company, 36 £20 Shares.
- Bournemouth Gas and Water Company, 84 Original and "B" Shares.
- Worthing Gaslight and Coke Company, 117 £10 Shares.
- Chipping Norton Gas Company, 211 Shares.
- Ascot District Gas Company, 83 £10 Shares.
- Wandsworth and Putney Gaslight and Coke Company, £76 10s. "D" Stock.
- Enfield Gas Company, 11 £10 Shares.
- Winchester Water and Gas Company, 12 £25 Shares.
- West Kent Gas Company, 17 Shares.
- Portsea Island Gas Company, 7 "A," "B," and "C" Shares.
- Bognor Gas Company, 5 Shares.
- Soham Gas Company, 30 £10 Shares.

All paying good Dividends and offering Investments of the very highest character.

Full Detailed Particulars, when ready, may be obtained of Mr. ALFRED RICHARDS, Auctioneer, 18, FINSBURY CIRCUS, E.C.

SCARBOROUGH GAS COMPANY.

SALE BY TENDER OF NEW ORDINARY STOCK.
(IN PURSUANCE OF THE SCARBOROUGH GAS ACT, 1895.)

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER, NEW ORDINARY STOCK of the Company, to the amount of £12,000; such Stock to bear a Maximum Dividend of 5 per cent. per annum, and to be paid up in full on or before the 1st day of July, 1896—being a portion of the Additional Capital authorized to be raised under the powers of the above-named Act, by a Resolution passed at a meeting of the Proprietors of the Company, specially convened for the purpose, and held on the 26th day of June, 1895.

Particulars and Conditions of Tender may be obtained on application at this Office; and sealed tenders must be sent in not later than Twelve o'clock at noon, on the 1st day of June, 1896.

By order,
J. HOLLIDAY,
Secretary.

Scarborough Gas Company's Offices,
32, Westborough, Scarborough,
April 13, 1896.

SCARBOROUGH GAS COMPANY.

SALE BY TENDER OF MORTGAGES FOR THE PURPOSE OF PAYING OFF EXISTING LOANS.
PURSUANT TO SECTION 21 OF THE SCARBOROUGH GAS ACT, 1895.

NOTICE is Hereby Given, that the Directors of the Scarborough Gas Company intend to SELL BY TENDER, MORTGAGES to the amount of £35,750, for the purpose of paying off existing Mortgages granted by the Company under their previous Acts.

The Mortgages will be granted under and by virtue of the Scarborough Gas Act, 1851, the Scarborough Gas Act, 1859, the Scarborough Gas Act, 1867, and the Scarborough Gas Act, 1873, or some or one of them, and subject to the Provisions of the Special Acts of the Company. They will be issued for amounts of £100 each, and will bear interest at the rate of 3½ per cent. per annum, payable half yearly, and the principal moneys secured thereby will be repayable at the end of 20 Years from the 1st of July, 1896.

These Mortgages will rank before the whole of the Company's existing and authorized Share Capital (of which at present £155,994 15s. is issued and fully paid, and a further £12,000 is now about to be issued); and the Interest thereon will have the priority of payment over all Dividends on such Share Capital.

Tenders must be sent in to the Company's Offices, 32, Westborough, Scarborough, not later than Twelve o'clock noon on Monday, the 1st of June, 1896. But no tender will be accepted at a lower price than £100 for each Mortgage; and every Purchaser must pay the whole of his Purchase-Money on or before Wednesday, the 1st of July, 1896.

Copies of the Company's Special Acts may be seen at the Company's Offices, where Particulars and Forms of Tender may be obtained on application.

By order of the Directors,
J. HOLLIDAY,
Secretary.

Scarborough Gas Company's Offices,
32, Westborough, Scarborough,
April 17, 1896.

Fcap. 4to, Cloth, price 7s. 6d., post free.

Practical Photometry.

By William Joseph Dibdin, F.I.C., F.C.S.

LONDON: Walter King, 11, Bolt Court, Fleet St., E.C.

IMPERIAL CONTINENTAL GAS ASSOCIATION.
INCORPORATED BY ACT OF PARLIAMENT.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association was held at the City Terminus Hotel, Cannon Street, London, on Tuesday, the 5th inst.,

THOMAS HENRY GOODWIN NEWTON, Esq., in the Chair when the following RESOLUTIONS were unanimously passed:—

"That the Report of the Directors upon the affairs of the Association be received, adopted, and entered upon the Minutes."

"That a Dividend of 5 per cent. for the Half Year ended the 31st of December last and a Bonus of 1 per cent. be declared upon the £3,800,000 Capital Stock of the Association, and that the same be payable, free of income-tax, on and after the 12th of May next."

"That John Horsley Palmer, Esq., be re-elected a Director of the Association."

"That Robert Tindall, Esq., be re-elected a Director of the Association."

"That Sir Charles James Jessel, Bart., be re-elected a Director of the Association."

"That Montagu Somes Pilcher, Esq., be re-elected an Auditor of the Association."

"That the cordial thanks of the Meeting be given to the Directors for their able management of the affairs of the Association, to the Chairman for his conduct in the Chair this day, and to the Staff in London and on the Continent."

By order of the Board,
ROBT. W. WILSON,
Secretary.

21, Austin Friars, London, E.C.,
May 6, 1896.

STOCKPORT DISTRICT WATER-WORKS COMPANY.

ISSUE OF £5000 NEW ORDINARY STOCK.

BY the Stockport District Water Order, 1890, confirmed by the Water Orders Confirmation (No. 1) Act, 1890, the Stockport District Water-Works Company are authorized to raise, by way of New Capital, any further Sums not exceeding in the whole £32,000, by the issue of New Ordinary Shares or Stock, or New Preference Shares, or Stock, as therein mentioned.

The Company have resolved to create and issue £5000 NEW ORDINARY STOCK.

The said Order provides that the Company shall not in any Year make out of their Profits any larger Dividend on such New Ordinary Stock than £7 in respect of every £100 actually paid up of such Stock.

The Directors of the Company are now prepared to receive TENDERS for the purchase of such £5000 of New Ordinary Stock in lots of £100 each nominal value.

No Tender will be accepted for any Lot at a price less than the reserve, which cannot be less than the nominal value of such lot.

Every tender shall be deemed to be made subject to the conditions herein mentioned, and to the conditions of the said Order.

Tenders must be made on or before Monday, the 25th day of May, 1896.

The Directors do not bind themselves to accept any tender.

Forms of Tender and full Particulars can be obtained at the Company's Office, or at the Offices of Messrs. Earle, Sons, and Co., Solicitors, 54, Brown Street, Manchester.

Tenders must be addressed to the Directors of the Stockport District Water-Works Company, St. Peter's Square, Stockport, and endorsed outside "Tender for Stock."

By order,
ALFRED M. PRICE,
Secretary.

St. Peter's Square, Stockport,
April 23, 1896.

Price 6s., Cloth Bound,

THE CHEMISTRY OF ILLUMINATING GAS.

By N. H. HUMPHRYS, Assoc. M.Inst.C.E., F.C.S.

This work contains chapters on: The Relative Cost of Light from Gas, Oil, and Candles; Products of Combustion; The Sulphur Question; The Composition of Illuminating Gas; Water Gas; Various Gas-Making Processes; Oil Gas; Properties of Fluid Hydrocarbons; Tar for Gas-Making; Destructive Distillation; Condensation; and Purification.

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

In Paper Cover, Price 1s.

GASHOLDERS WITH OR WITHOUT GUIDE-FRAMING.

A DISCUSSION
BETWEEN
E. LLOYD PEASE & F. SOUTHWELL CRIPPS.

To which is added a Synopsis of all the Literature (English and Foreign) on Reducing or Abolishing the Guide-Framing of Gasholders, also the principal Literature on Gasholder Construction generally, compiled to March, 1893; with a List of all the English and Foreign Periodicals connected with the Gas Industry.

By F. SOUTHWELL CRIPPS.

LONDON:
WALTER KING, 11, BOLT COURT, FLEET STREET, E.C

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.
— *v.* —
"DE MARE" COMPANY,

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.
— *v.* —
"SUNLIGHT" COMPANY,

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, HEREBY GIVE NOTICE, as follows:—

VALIDITY. The Company's Patent has been declared Valid on all points after a Fifteen-Day Trial.

NATURE OF INVENTION. The Invention was described by Mr. Justice Wills as a "Pioneer Invention."

SCOPE OF PATENT. The Patent has been given a wide construction; and it was held that the protection given by it was not confined to Mantles manufactured according to the particular prescriptions set out in the Specification.

SHAPE OF MANTLE. The Judge held that a Mantle, even if made in a different form or shape (such as the "De Mare" Fringe or Plume), is still an Infringement of the "Welsbach" Patent.

"DE MARE" JUDGMENT. Judgment for an Injunction, with full Costs, has been given against the "De Mare" Incandescent Gas-Light System.

"SUNLIGHT" JUDGMENT. Judgment was given against the "Sunlight" Incandescent Gas-Lamp Company, Limited, on the question of the Validity of the Plaintiffs' Patent.

"SUNLIGHT" MANTLES. Last about 100 hours.

"WELSBACH" MANTLES. Last about 1000 hours.

"Sunlight" Mantles burn double the gas to produce the same candle power as the Incandescent Gas-Light Company's Mantles.

Users of "Sunlight" Mantles are applying to the Incandescent Gas-Light Company to replace them by their own Mantles.

WARNING. Users of the Incandescent Gas-Light Company's Mantles upon "Sunlight" Burners are Infringers of the Company's Patent, and will be at once proceeded against.

COSTS. Certificates of the Validity of the Company's Patent have been granted both by Mr. Justice Romer and Mr. Justice Wills entitling the Company to Solicitor and Client Costs, which will, in all cases, be rigorously enforced.

INFRINGERS. Actions have been commenced, and are pending against Makers and Sellers of all forms of Incandescent Mantles. The Incandescent Gas-Light Company will take Proceedings against all persons infringing their Patent, whether,
MAKERS,
WHOLESALE DEALERS,
RETAILERS,
or
USERS.

"LIMITED LICENSE." Users of the Company's Mantles upon Burners not sold by the Company are Infringers.

WARNING. Judgments have already been obtained against such users from Mr. Justice Chitty, Mr. Justice Stirling, and Mr. Justice Kekewich.

FAITHFULL & OWEN,
11, Victoria Street,
Westminster.
Solicitors to the Incandescent Gas-Light Company, Limited.

April, 1896.

NOTICE.

The attention of the METEOR INCANDESCENT LIGHTING COMPANY, LIMITED, having been again called to the Advertisements inserted in various papers by the Incandescent Gas-Light Company, Limited, of Palmer Street, Westminster, to the effect that the "Meteor" Incandescent Gas-Lights are an Infringement of their Patents, and that they will bring Actions for Infringement against all persons found dealing in any manner with such Lights, the METEOR INCANDESCENT LIGHTING COMPANY, LIMITED, HEREBY GIVE NOTICE that they are advised that the "Meteor" Incandescent Lights in no way infringe any of the Patents of the Incandescent Gas-Light Company, Limited, that an action has been commenced to restrain such threats, and that they are PREPARED TO FULLY INDEMNIFY ALL PURCHASERS, DEALERS, AGENTS, and USERS of their Lights against any Legal Proceedings on the part of the Incandescent Gas-Light Company, Limited.

WILSON, BRISTOWS, & CARPMAEL,
1, Copthall Buildings, London, E.C.,
Solicitors to the Meteor Incandescent Lighting Company, Limited, of 35, New Broad Street, London, E.C.

Nov. 30, 1895.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

HUNTER'S
OXIDE OF IRON.
JAMES HUNTER, MINER, AND SHIPPER OF
NATURAL IRISH BOG ORE.
This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.
Samples and Prices on application.
5, PRINCES STREET, PORT GLASGOW.
Telegrams: "HUNTER, PORT GLASGOW."
Established 1872.

NEEDFUL NOTICE.
Our London Office for Visitors to the Metropolis is still
3 & 4, Lime Street Square, E.C.;
BUT
ALL COMMUNICATIONS
MUST NOW BE ADDRESSED—
NEW CONVEYOR CO., LTD.,
TRANSPORT APPLIANCE WORKS,
SMETHWICK,
BIRMINGHAM.
Telegraphic Address: "APTITUDE, BIRMINGHAM."
Telephone No. 2050.

BOLDON GAS COALS.
Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to
The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For Prices, &c., apply to the
HARTON COAL COMPANY, LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 81, OLD BROAD ST., E.C.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.,

B Lombard Street, NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton. . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton. . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES, NEWCASTLE-UPON-TYNE.

LITTLE & GRAHAM, LD.

THE INCLINED RETORT SPECIALISTS

TRANSPORT APPLIANCE WORKS,

SMETHWICK,

BIRMINGHAM.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL CO., LD.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . . 10,500 Cub. Ft.
Illuminating Power . . 16·9 Candles.
Coke (of good quality) . . 67·5 per Cent.
Sulphur . . . . . 0·58 ,,
Ash . . . . . 2·73 ,,

For Price, &c., apply to the

WEARDALE IRON & COAL CO., LD.

QUAYSIDE, NEWCASTLE-ON-TYNE.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

LOW MOOR BLACK BED GAS COAL.

YIELD OF GAS PER TON - 10,375 CUBIC FEET.
ILLUMINATING POWER - 17·50 SPERM CANDLES.
COKE - - - - - - - - 75 PER CENT.

Prices, f.o.r. or f.o.b., on application to

GEORGE & JOHN HAIGH,

RAVENS LODGE AND CONYERS' COLLIERIES,

DEWSBURY.

A TRIAL IS RESPECTFULLY SOLICITED.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 17·8 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,

COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

E. FOSTER & CO.,

12, JOHN STREET, ADELPHI, LONDON, W.C.

INCANDESCENT GAS-LIGHT COMPANY, LIMITED,

v.

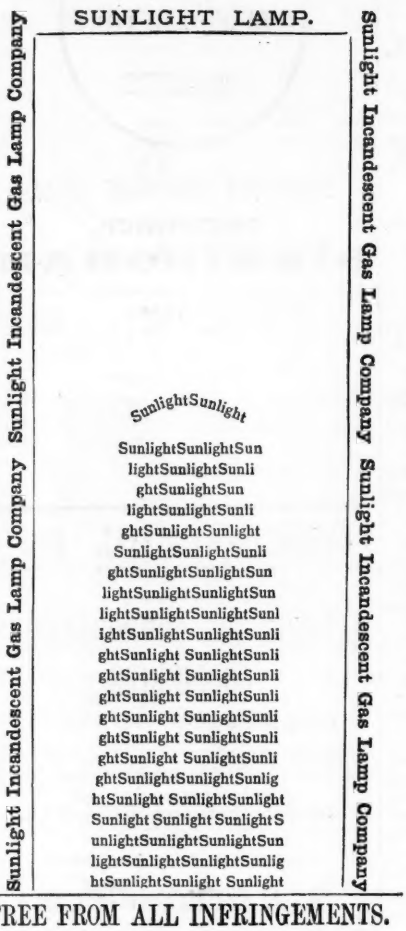
SUNLIGHT GAS-LAMP COMPANY, LIMITED.

JUDGMENT FOR SUNLIGHT COMPANY.

EXTRACTS FROM JUDGMENT.

"No use is made by the Defendants of any of the 'rare earths;' and their choice of substances and their method of applying the illuminants appear to me to be as wide asunder as the poles from those contemplated by Welsbach."

Welsbach "could make no use of the great strength and tenacity of alumina." "The Sunlight process uses alumina very largely indeed."



EXTRACTS FROM JUDGMENT.

Welsbach Company's Counsel "both admit that they have no case unless the Welsbach skeleton, of whatever resistant earth oxides composed, is within the Welsbach Patent. Mr. Terrell says the consequences of an adverse decision on this point are very grave. I am very sorry if they are so; but I cannot help it. It seems to me that this is just what Welsbach did not claim."

FREE FROM ALL INFRINGEMENTS.

Free from all Infringements.

STRONG RESISTANT MANTLE.

PURE SOFT LIGHT.

CHEAP MAINTENANCE.

Show-Rooms—

SUNLIGHT INCANDESCENT COMPANY, LIMITED,

79, Queen Victoria Street, E.C.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

THE DRUM
FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.
See Advertisement in last and next issue.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

OXIDE OF IRON.
NATURAL BOG ORE FROM OWN MINES.
Samples and Prices on application.
WM. H. MÜLLER & CO.,
81, PALMERSTON BUILDINGS, LONDON, E.C.
TRADE MARK: "Compascum." Telegraphic Address: "FERRUM."

W. E. SANDER,
COMMISSION AGENT, BERLIN, 41, FRIEDRICH STR.
SPECIALITIES: Incandescent Lamp Burners and Mantles (with or without electric lighting from any distance, by button from the wall, etc.).
INCANDESCENT SPIRIT LAMPS.
Electro-technical Ware of all kinds.
IMPORT and EXPORT.

OSLER,
BIRMINGHAM.
MANUFACTURERS
OF GASELIERS
IN GLASS AND METAL.

BOWENS' Ltd. Successors,
STOURBRIDGE.
MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
Established 1860.

STOURBRIDGE
RETORTS AND FIRE-BRICKS.
BEST QUALITY.
KING BROTHERS, STOURBRIDGE.
[See Illustrated Advertisement, May 5, p. 1006.]

WILLIAM INGHAM & SONS,
Incorporated with the Leeds Fire-Clay Company, Ltd.,
WORTLEY FIRE-CLAY WORKS,
Near LEEDS,
Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—
1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT
MACHINE-MADE GAS-RETORTS.

Wrought-Iron

And Fittings and Accessories.

LAMBERT BROS., WALSALL,
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM,
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Short Street, LAMBETH.

JAMES MILNE & SON, LTD.,
GAS ENGINEERS,
MILTON HOUSE WORKS, EDINBURGH.
LONDON. — GLASGOW. — LEEDS.

THE "SIMPLEX" CARBURETTER
W. E. PRICE'S PATENT.
A NEW AND PERFECT METHOD OF ENRICHING GAS IN LARGE OR SMALL QUANTITIES AT A MOMENT'S NOTICE.
Special Features of the "SIMPLEX"—
SIMPLICITY, PERMANENCE OF RESULTS, CHEAPNESS, AND ENTIRE ABSENCE OF CONDENSATION.
For Prices and further Particulars, apply to the Manufacturers,
GIBBONS Bros., Ltd., DUDLEY.

IMPROVEMENTS IN STREET LIGHTING.

HIGHEST EFFICIENCY WITH GREATEST ECONOMY.

LIGHTING AUTHORITIES, GAS ENGINEERS, & GAS MANAGERS

Are invited to inspect the

INCANDESCENT GAS-LIGHT

Which has now been successfully adapted to the purposes of

STREET LIGHTING,

THE DIFFICULTIES CAUSED BY VIBRATION HAVING BEEN OVERCOME BY THE USE OF A SPECIAL BURNER, WHICH GIVES HIGHLY SATISFACTORY RESULTS.

Two forms of Burners are specially recommended for Street Lighting:—

THE "C" BURNER,

Giving a light of **60** Candles, with a Consumption of **3½** Cubic Feet of Gas an hour.

THE "S" BURNER,

Giving a Light of **25** to **30** Candles, with a Consumption of **2¼** Feet of Gas an hour.

This System of Lighting meets the Requirements of all the Lighting Authorities in those Districts where it is desired to effect an Improvement in Street Lighting, without any increase of expenditure.

THE INCANDESCENT GAS-LIGHT has been tried with most satisfactory results for Street Lighting purposes in many Towns throughout the United Kingdom.

The Lighting Engineer of the Kensington Vestry, in a report dated the 14th of May, 1895, addressed the Works and Sanitary Committee as follows:—

(1) During the months of January, February, and March, 1895, 31 Incandescent Gas-Lamps were in use for an average period of 1167·89 hours.
The estimated quantity of gas that would have been consumed by the 10-feet flat-flame burner was 11,678 cubic feet. The actual quantity of gas used by the Incandescent Gas-Light Company's Burners, as recorded by the meters, was 4415 cubic feet.
After allowing for the extra cost of up-keep, the gain to the Vestry by the use of these burners was £20 3s. 4½d., and a large increase in the Illumination of the Street.

(2) The illuminating power given by the Incandescent Gas-Burners, consuming 3·78 cubic feet of gas per hour, was found to be equal to 60 candles. That given by the flat-flame burners, consuming 10 cubic feet of gas per hour, was 26 candles.
The lanterns fitted with Incandescent Burners only require cleaning 9 times in 90 days, as compared with 26 times' cleaning in the same period required by the lanterns fitted with flat-flame burners.

The net result therefore appears to be that, by the use of the Incandescent Gas-Light System, the saving effected is 15s. per lamp for this quarter, after paying for the up-keep of the Burner, and at the same time more than double the light is obtained. It must be noted, however, that these results were obtained with the ordinary burners, and not with the improved burners with the anti-vibration springs. With the latter, the expense of up-keep would be materially reduced, and the saving consequently increased.

For further Particulars, apply to

THE INCANDESCENT GAS-LIGHT COMPANY, LTD.,

PALMER STREET, WESTMINSTER, LONDON, S.W.

WEST'S GAS IMPROVEMENT COMPANY, LTD.,

ALBION IRON-WORKS, MILES PLATTING MANCHESTER.

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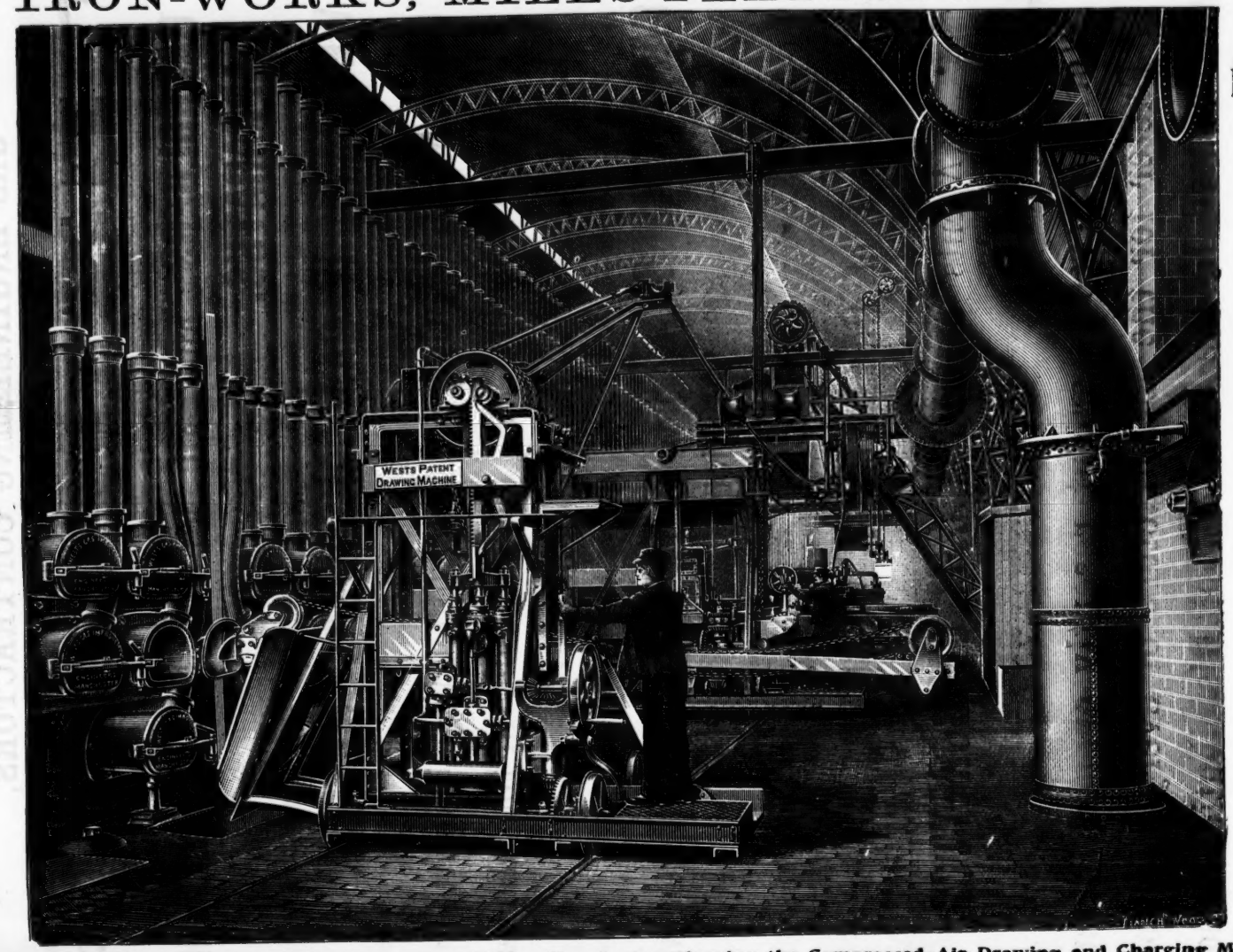

Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

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For **GASHOLDERS** and all kinds of **ENGINEERING APPARATUS.**

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Have constructed their EUROPEAN type of

CARBURETTED WATER-GAS PLANT

At the following Gas-Works:—

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Belfast	1,700,000 ,,	Brighton	1,250,000 ,,
Glasgow	300,000 ,,	Bath	1,000,000 ,,
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Santiago	400,000 ,,	Southport	750,000 ,,
Swansea	700,000 ,,	New York	1,000,000 ,,
Tottenham	600,000 ,,	Newburgh, N.Y.	350,000 ,,

And have now under Contract:—

Belfast (Second Contract)	3,500,000 Cub. Ft.	Manchester	3,000,000 Cub. Ft
Edinburgh	2,000,000 ,,	Brussels (Second Contract)	700,000 ,,
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Winchester	200,000 ,,	Holyoke, Mass.	500,000 ,,
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In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

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Analysis: 12,600 Feet of 19-Candle Gas per Ton.

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Full Particulars may be obtained from the Sole Makers,

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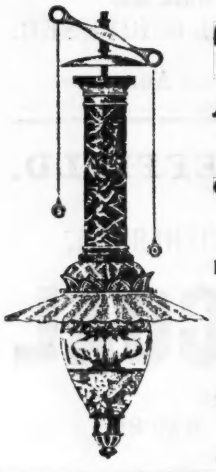

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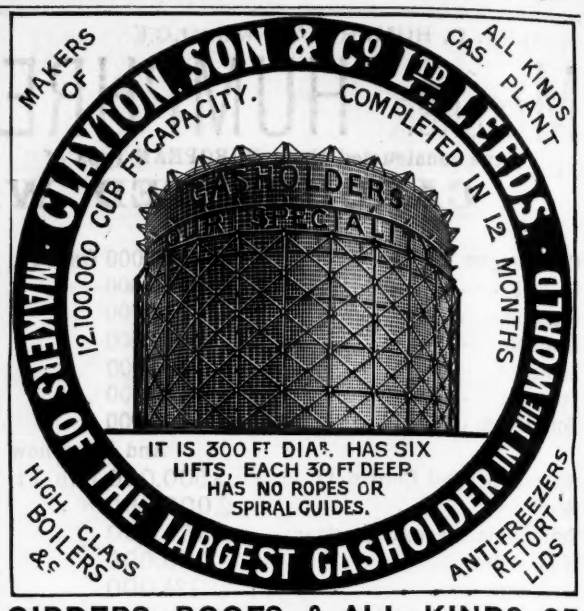
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IT IS 300 FT DIAR. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
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The ONLY GAS-PENDANT suitable for Domestic Lighting; a room 18 ft. by 14 ft. being beautifully illuminated with one Incandescent Burner.

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it quite **supersedes** the familiar three-light pendant. We are able to bear witness to the **convenience** of the New Pendant."

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Over 292,000,000 Cubic Feet of Gas per Day is passing through about 550 of these Machines.

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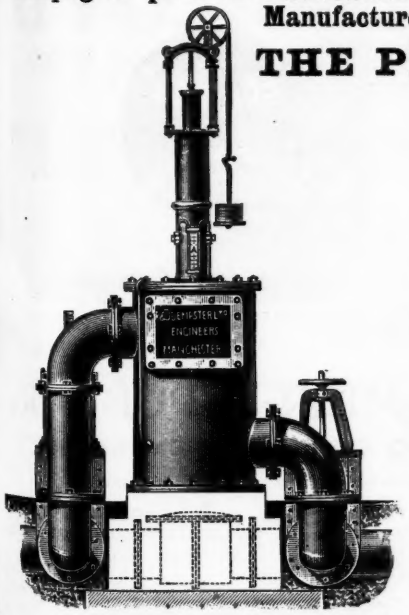

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This Apparatus is in very general use in most of the Gas-Works on the Continent and in America; over **550** being in use in different parts of the World for condensing and arresting all Tar Particles and Vapours from the Gases from Coal, Oil, and Wood.

The large number in use is sufficient proof of its utility. By the almost complete elimination of Tar, which is effected to the extent of 99·7 per cent., it facilitates Purification in the Purifiers, by preventing the clogging or obstruction of the Purifying Materials, which, in consequence, last much longer; thus effecting a Saving both in Materials and Labour.

So effective is this Apparatus that a piece of white paper placed over a Test-Tap on the Inlet of the Machine is immediately covered with Tar, whilst on the Outlet the white paper remains perfectly clean.

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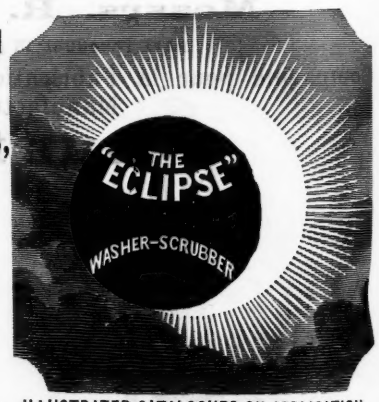

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